EXHIBIT 4.2

FERC FEIS for MIDSHIP Project (continued)

4.0 ENVIRONMENTAL ANALYSIS

This section describes the affected environment as it currently exists and the environmental consequences of the project. The section is organized by the following major resource topics: geology; soils; water resources; wetlands; vegetation; wildlife and aquatic resources; special status species; land use, recreation, special interest areas, and visual resources; socioeconomics (including transportation and traffic); cultural resources; air quality and noise; reliability and safety; and cumulative impacts.

The environmental consequences of constructing and operating the project would vary in duration and significance. Four levels of impact duration were considered: temporary, short-term, long-term, and permanent. Temporary impacts generally occur during construction with the resource returning to preconstruction condition almost immediately afterward. Short-term impacts could continue for up to 3 years following construction. Impacts were considered long-term if the resource would require more than 3 years to recover. A permanent impact could occur as a result of any activity that modifies a resource to the extent that it would not return to preconstruction conditions during the life of the project. We considered an impact to be significant if it would result in a substantial adverse change in the physical environment.

Midship Pipeline, as part of its proposal, developed certain mitigation measures to reduce the impact of the project. In some cases, we determined that additional mitigation measures could further reduce project impacts. Our additional mitigation measures appear as bulleted, boldfaced paragraphs in the text of this section and are also listed in section 5.2. We will recommend to the Commission that these measures be included as specific conditions in any Certificate the Commission may issue to Midship Pipeline for the project.

The conclusions in the EIS are based on our analysis of the environmental impact and the following assumptions:

- Midship Pipeline would comply with all applicable laws and regulations;
- the proposed facilities would be constructed as described in section 2.0 and the recommendations listed in section 5.2 of the EIS; and
- Midship Pipeline would implement our recommended mitigation measures, the mitigation measures included in its application and supplemental submittals to FERC and the cooperating agencies, and other applicable permits and approvals requirements.

4.1 GEOLOGY

4.1.1 Physiographic Setting

The northwestern portion of the MIDSHIP Project, including the Mainline between about MPs 0 and 155, the Chisholm Lateral, the Velma Lateral, and associated facilities, would cross the Osage Plains section of the Central Lowlands physiographic province in central Oklahoma. The Anadarko Basin, also known locally as the Red Bed Plains, is the largest physiographic land region in Oklahoma and is within the Osage Plains section. The Anadarko Basin encompasses an area of about 58,000 square miles, and is one of the deepest sedimentary basins in the continental United States, comprised of about a 40,000-foot-thick sequence of sedimentary bedrock dating from the Cambrian to Cretaceous Periods. Ground surface elevations in the basin range from about 540 feet above mean sea level in the southeastern portion of the project area to 1,530 feet above mean sea level in the northwestern portion of the project area (Kansas

Geological Survey, 1996; Johnson, 1988; USGS, 2017a). Between about MP 155 and the end of the Mainline, the project would cross the West Gulf Coastal Plain section of the Coastal Plain physiographic province in southeastern Oklahoma. The West Gulf Coastal Plain is characterized by south-dipping Cretaceous-period clay, sand, gravel, and thin limestone beds (Fenneman, 1923; Fenneman and Johnson, 1946).

4.1.2 Geologic Setting

4.1.2.1 Surficial and Bedrock Geology

The surficial and bedrock geology in the project area was determined using available information from the USGS, NRCS, and the Oklahoma Geological Survey (OGS). Table 4.1.2-1 lists the rock types and approximate elevations associated with the project facilities.

The sandstone, shale, and conglomerate formations within the basin have produced significant quantities of oil and gas (Ball et al., 1988; USGS, 2017a). Quaternary alluvium and terrace deposits are associated with river and stream erosion and deposition activity in the project area. These unconsolidated sand and gravel deposits, in addition to the Permian gypsum deposits, are considered exploitable surface mineral resources (Johnson, 2008).

The tectonic uplift that resulted in the formation of the Anadarko Basin during the Pennsylvanian-period created a series of west-northwest trending thrust faults associated with the Wichita fault system, which are crossed by the project. Section 4.1.4.2 provides the locations of mapped faults and describes seismic hazards associated with faults in greater detail.

4.1.2.2 Shallow Bedrock and Blasting

Areas where bedrock is less than 5 feet below the ground surface are considered areas of shallow depth to bedrock. The NRCS Soil Survey Geographic (SSURGO) database was used to identify areas where bedrock may be encountered along the pipeline routes. The majority of the project facilities would be underlain by sedimentary bedrock, and discrete sections of the southern portion of the Mainline would cross coarse-grained granite. As shown in table 4.1.2-2, portions of the project in each county would cross shallow sedimentary paralithic bedrock, while shallow lithic bedrock is primarily in the southeastern portion of the Mainline.

About 61.0 miles (31 percent) of the Mainline, 17.2 miles (84 percent) of the Chisholm Lateral, and 6.3 miles (46 percent) of the Velma Lateral may encounter bedrock less than 5 feet below the ground surface. All of the shallow bedrock along the Chisholm Lateral and Velma Lateral is soft, paralithic bedrock and would not likely require blasting. Section 4.2.1.1 provides additional information regarding shallow bedrock within the proposed workspace. Midship Pipeline would attempt to excavate shallow paralithic bedrock using conventional, non-blasting techniques and equipment such as a backhoe, ripping with a bulldozer, or hammering using a pointed backhoe attachment and subsequent excavation. About 14.1 miles of the Mainline is hard, lithic bedrock that could require blasting or other special construction techniques. Of the 14.1 miles of lithic bedrock, the area that would most likely require blasting is between about MPs 148 and 155, where crystalline granite is present less than 5 feet below the ground surface in discrete sections. In addition, shallow paralithic bedrock is present at the Tatums Compressor Station and Sholem Booster Station sites. Grading and site preparation, and construction of foundations or other site appurtenances, would not likely require blasting during construction.

TABLE 4.1.2-1

Geologic Materials and Elevations Crossed by the MIDSHIP Project

Facility	County	Milepost	Rock Types	Approximate Elevation (feet)
Pipeline Facilities				
Mainline	Kingfisher	0.0 to 0.5	Conglomerate and shale	1,200 to 1,220
	Canadian	0.5 to 28.3	Conglomerate, shale, siltstone, evaporite, dolostone (dolomite), sandstone, unconsolidated sand and gravel, and alluvium	1,230 to 1,530
	Grady	28.3 to 78.4	Alluvium, unconsolidated sand and gravel, shale, sandstone, and conglomerate	990 to 1,420
	Garvin	78.4 to 85.2 and 89.7 to 100.4	Sandstone, conglomerate, shale, unconsolidated sand and gravel	900 to 1,215
	Stephens	85.2 to 89.7	Shale, sandstone, and conglomerate	1,030 to 1,200
	Carter	100.4 to 138.7	Shale, sandstone, conglomerate, unconsolidated sand and gravel, limestone, mudstone,	675 to 1,080
	Johnston	138.7 to 170.1	Sandstone, conglomerate, mudstone, shale, limestone, granite, and alluvium	650 to 860
	Bryan	170.1 to 199.6	Limestone, mudstone, shale, alluvium, claystone, carbonate, sandstone, unconsolidated sand and gravel	540 to 700
Velma Lateral	Garvin	VE0.0 to VE8.4	Sandstone, conglomerate, and shale	910 to 1,020
	Carter	VE8.4 to VE11.7	Sandstone, conglomerate, and shale	915 to 1,020
	Stephens	VE11.7 to VE13.8	Sandstone, conglomerate, and shale	960 to 1,065
Chisholm Lateral	Kingfisher	CH0.0 to 20.4	Shale, sandstone, conglomerate, and alluvium	1,090 to 1,215
Tie-in Piping	Canadian	TP0.0 to TP0.2	Shale, sandstone, and siltstone	1,500
Aboveground Facilities				
Chisholm Meter Station	Kingfisher	CH0.0	Sandstone and conglomerate	1,150
Okarche/MarkWest Meter Station	Kingfisher	0.0	Conglomerate and shale	1,220
Canadian Valley Meter Station	Canadian	10.6	Shale and sandstone	1,410
Cana Meter Station	Canadian	15.2	Shale and sandstone	1,480
Calumet Compressor Station	Canadian	17.6	Sandstone and shale	1,520 to 1,540
Iron Horse Meter Station	Grady	47.5	Siltstone and shale	1,200
Grady Meter Station	Garvin	78.8	Sandstone and conglomerate	1,140
Tatums Compressor Station	Garvin	99.4	Sandstone, conglomerate, and shale	960 to 980
Velma Meter Station	Stephens	VE0.0	Sandstone, conglomerate, and shale	947
Sholem Booster Station	Stephens	VE7.3	Sandstone and shale	1,040
NGPL 801 Meter Station	Carter	118.1	Unconsolidated sand and gravel	885
Bennington Compressor Station and NGPL Meter Station	Bryan	198.4	Sandstone and shale	580
Bennington Meter Station	Bryan	199.6	Sandstone and shale	605

Source: USGS, 2005, 2017a; Soil Survey Staff, 2017a; Terracon, 2017

TABLE 4.1.2-2

Potential Areas of Shallow Bedrock Crossed by the MIDSHIP Project

Facility	County	Total Crossing Length (miles)	Bedrock Type [a]	
			Lithic (miles)	Paralithic (miles)
Pipeline Facilities				
Mainline	Kingfisher	0.4	0.0	0.1
	Canadian	27.8	3.2	0.0
	Grady	50.1	0.0	24.8
	Garvin	17.5	0.0	9.7
	Stephens	4.5	NA	3.8
	Carter	38.4	3.5	4.4
	Johnston	31.3	6.3	3.5
	Bryan	29.5	1.1	0.8
Subtotal		**199.6**	**14.1**	**46.9**
Chisholm Lateral	Kingfisher	20.5	0.0	17.2
Subtotal		**20.5**	**0.0**	**17.2**
Velma Lateral	Stephens	8.4	0.0	4.7
	Carter	3.4	0.0	0.7
	Garvin	2.1	0.0	0.9
Subtotal		**13.8**	**0.0**	**6.3**
Tie-in Piping	Canadian	0.2	0.0	0.0
Subtotal		**0.2**	**0.0**	**0.0**
TOTAL		**234.1**	**14.1**	**70.4**

Sources: Soil Survey Staff, 2017a

[a] Paralithic refers to "soft" or weathered bedrock that is unlikely to require blasting during construction. Lithic refers to "hard" crystalline bedrock that may require blasting or other special construction techniques during installation of the pipeline.

4.1.3 Mineral Resources

Midship Pipeline conducted a review of the project area using publically available mineral resource information from the USGS Mineral Resources Data System.

Mineral resources in the project area include oil and gas wells and surface mines, which are primarily sand, gravel, or limestone pits. One active gypsum-anhydrite surface mine is about 420 feet northeast of the Mainline at MP 2.9; the remaining mines identified, all of which are inactive, are between about 240 and 1,300 feet from the Mainline centerline. These inactive mines were formerly used to extract aggregate material (e.g., sand, gravel, crushed stone) and available mining resources did not identify ongoing or planned reclamation activities for them. These types of gravel and crushed stone mines are typically not associated with acid drainage contamination or large tailings piles (U.S. Environmental Protection Agency [EPA], 1994, 2000); thus, it is unlikely that the project would encounter contamination associated with the surface mines in the project area. No underground mines were identified within 0.25 mile of the project.

Table 4.1.3-1 summarizes mineral resources that have been identified within 0.25 mile of project centerlines. No oil and gas wells or surface mines were identified within 0.25 mile of the proposed

compressor station sites. Of the wells identified, 53 active oil and gas wells are within 150 feet of the Mainline, Chisholm Lateral, and Velma Lateral project workspace.

TABLE 4.1.3-1

Summary of Mineral Resources Within 0.25 Mile of the MIDSHIP Project

	Surface Mines		Oil and Gas Wells	
Facility	Active	Inactive	Active	Inactive
Mainline	1	7	279	42
Chisholm Lateral	0	0	29	5
Velma Lateral	0	0	278	48
Tie-in Piping	0	0	1	0
TOTAL	**1**	**7**	**587**	**95**

Sources: USGS, 2016; Rextag, 2017

While 587 active oil and gas wells and 1 active surface mine were identified in proximity to the MIDSHIP Project, none of them are within the proposed workspace. In addition, it appears that existing pipelines near MP 2.9 preclude expansion of the active gypsum-anhydrite mine west towards the proposed Mainline; therefore, we conclude that construction and operation of the MIDSHIP Project would not affect these wells or the mine. However, due to the prevalence of historic and current oil and gas development in the project area, it is possible that Midship Pipeline could encounter a previously unidentified oil and gas well during construction of the project.

4.1.4 Geologic Hazards

Geologic hazards are naturally occurring or induced conditions that can result in damage to land and structures, or cause injury to people. Potential geologic hazards in the project area include induced seismicity and active faults, soil liquefaction, landslides, flash flooding, and karst topography.

4.1.4.1 Seismicity

Seismicity refers to the frequency, intensity, and distribution of earthquakes within a given area. Earthquakes generally occur when the two sides of a fault suddenly slip past each other. The movement creates ground motion, which can damage property and structures if the motion is sufficiently intense. The majority of earthquakes occur along boundaries of tectonic plates.

Seismic risk can be quantified by the motions experienced by the ground surface or structures during a given earthquake. The measurement of ground motion is peak ground acceleration (PGA), generally expressed as a percentage of gravitational acceleration (g) for a generic bedrock condition. According to the USGS, the following seismic hazards are present along the proposed project route:

- PGA with a 2 percent probability in 50 years (recurrence interval of 1:2,500 years) ranges from 6 to 40 percent g (USGS, 2014); and
- PGA with a 10 percent probability in 50 years (recurrence interval of 1:475 years) ranges from 3 to 8 percent g (USGS, 2014).

The project would be within an area of Oklahoma that has experienced increased seismicity within the last decade. The OGS attributes the increased frequency and magnitude of earthquakes to the widespread practice of injecting saline waste water from oil and gas development activities into deep Underground Injection Control (UIC) disposal wells (OGS, 2015). The frequency of seismic events

increased from a rate of 21 earthquakes of magnitude 3.0 or greater in the central and eastern United States between 1973 and 2008 to a rate of 907 earthquakes of magnitude 3.0 or greater in Oklahoma in 2015 (USGS, 2017b; Oklahoma Office of the Secretary of the Energy and Environment, 2017). On September 3, 2016, a magnitude 5.6 earthquake occurred near Pawnee, Oklahoma, which was the largest earthquake on record in Oklahoma. Figure 4.1.4-1 shows the locations, magnitudes, and depths of earthquakes that occurred between 2010 and 2016, in addition to locations of faults relative to project facilities.

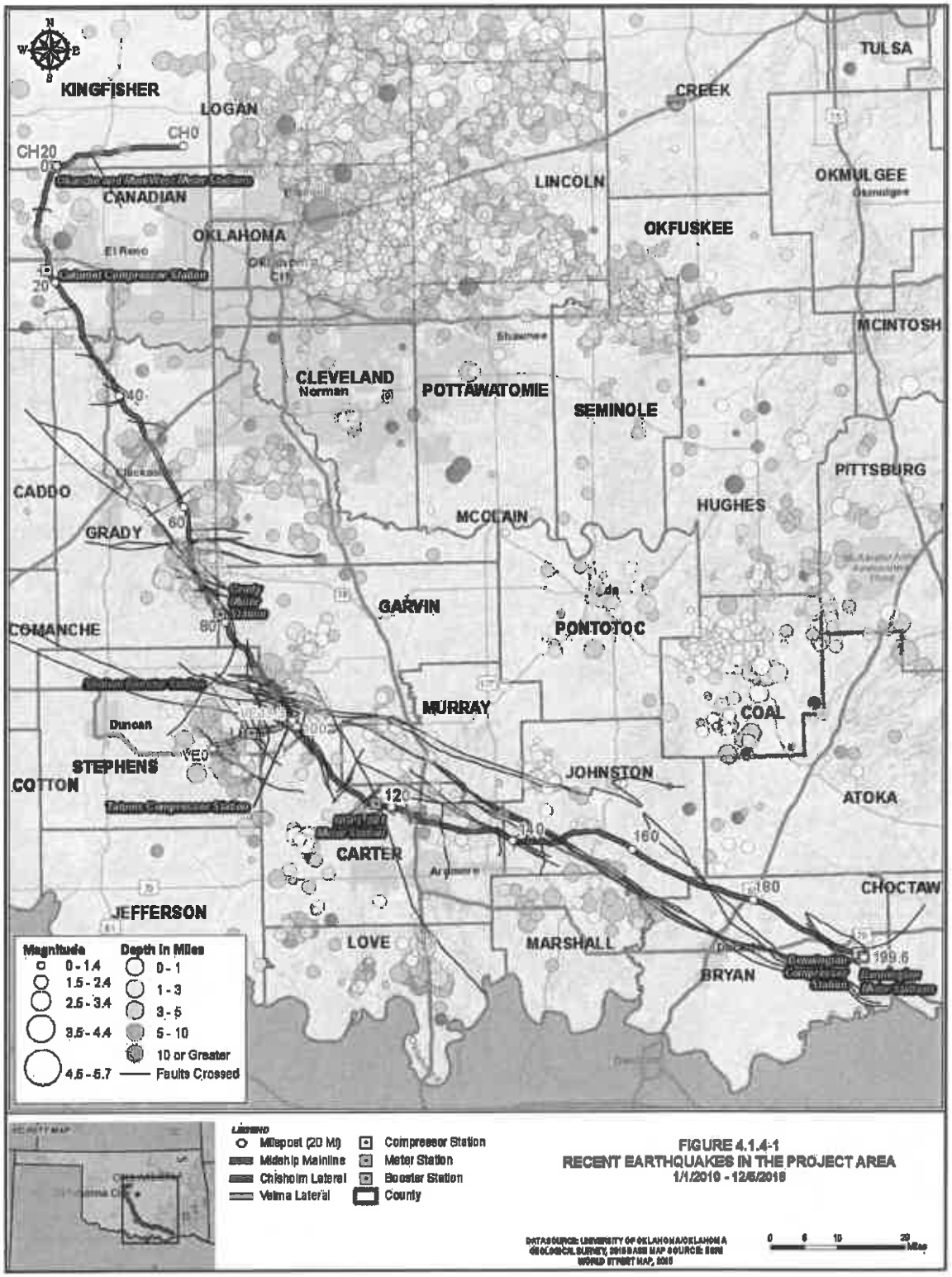
We received multiple comments requesting additional information regarding seismicity and induced earthquakes in the project area. Due to the recent increase in induced earthquakes, which are thought to be attributed to wastewater disposal through UIC wells, the USGS issued maps in 2016 and 2017 that consider seismic hazards due to natural and induced earthquakes using a 1-year projection. Based on the 2017 USGS seismic hazard mapping, the highest PGA value associated with induced seismicity along the project route (30 percent g) is in Grady County between about MPs 45 and 65. The 2016 and 2017 seismic hazard maps show high PGA values for counties in Oklahoma farther than 15.0 miles northeast of the project. Table 4.1.4-1 provides the PGA range from the 2014 USGS seismic hazard assessment (2 and 10 percent probability PGA mapping) compared to the 2016 and 2017 USGS 1-year induced seismic hazard projections for the project area; and figure 4.1.4-2 shows the 2017 USGS estimated seismic hazards and nearby UIC wells.

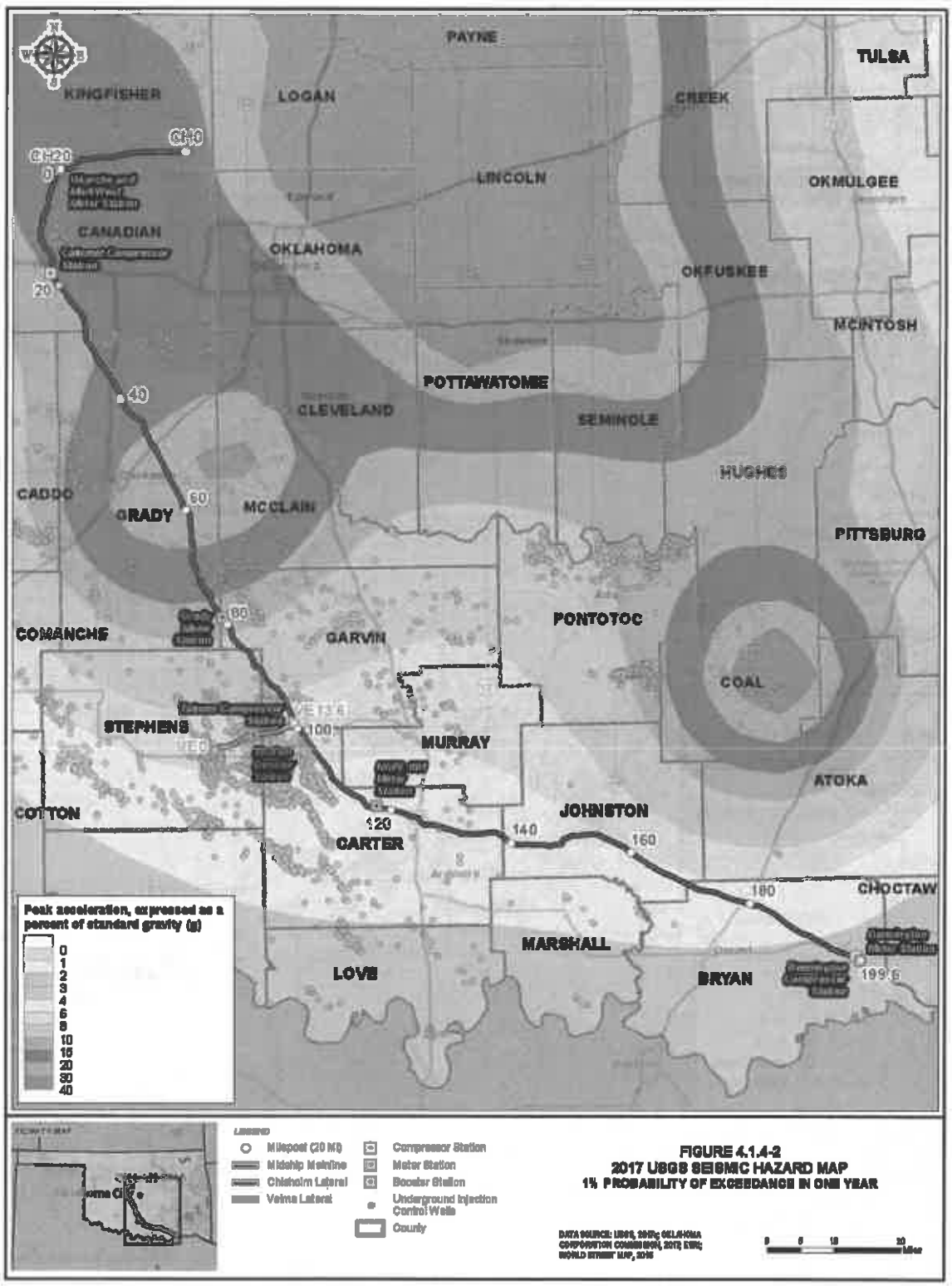
TABLE 4.1.4-1

Potential Seismic Hazard for the MIDSHIP Project

Facility	PGA with a 2 Percent Probability of Exceedance in 50 Years (percent g)	PGA with a 10 Percent Probability of Exceedance in 50 Years (percent g)	PGA with a 1 Percent Probability of Exceedance in 1 Year – 2016 (percent g)	PGA with a 1 Percent Probability of Exceedance in 1 Year – 2017 (percent g)
Pipeline Facilities				
Mainline	6 to 40	3 to 8	3 to 35	3 to 30
Chisholm Lateral	14 to 20	4 to 5	16 to 27	15 to 20
Velma Lateral	20 to 30	5 to 7	16 to 27	6 to 8
Tie-in Piping	14 to 20	4 to 5	16 to 27	15 to 20
Aboveground Facilities				
Chisholm Meter Station	14 to 20	4 to 5	16 to 27	15 to 20
Okarche/Mark West Meter Station	14 to 20	4 to 5	16 to 21	15 to 20
Canadian Valley Meter Station	14 to 20	5 to 6	21 to 27	15 to 20
Cana Meter Station	14 to 20	5 to 6	21 to 27	15 to 20
Calumet Compressor Station	14 to 20	5 to 6	21 to 27	15 to 20
Iron Horse Meter Station	20 to 30	6 to 7	21 to 27	20 to 30
Grady Meter Station	30 to 40	7 to 8	21 to 27	10 to 15
Tatums Compressor Station	20 to 30	6 to 7	16 to 21	6 to 8
Velma Meter Station	20 to 30	5 to 7	16 to 27	6 to 8
Sholem Booster Station	20 to 30	6 to 7	16 to 21	6 to 8
NGPL 801 Meter Station	14 to 20	5 to 6	10 to 12	4 to 6
Bennington Compressor Station and NGPL Meter Station	6 to 10	3 to 4	3 to 4	3 to 4
Bennington Meter Station	6 to 10	3 to 4	3 to 4	3 to 4

Sources: USGS, 2014 2016, 2017c





Based on information available from Rextag[1] (2017), there are about 33 UIC wells within 0.25 mile of the Mainline centerline, 1 UIC well within 0.25 mile of the Chisholm Lateral centerline, and 45 UIC wells within 0.25 mile of the Velma Lateral centerline. The Arbuckle formation, a deep sedimentary formation that overlies igneous basement rocks, is the target for most of the wastewater injection disposal operations in Oklahoma (OGS, 2015). The majority of UIC wells near the project area are within Stephens and Carter Counties; however, the USGS (2017) PGA values for these areas are less than 10 percent g. According to available information from the OGS, there is not a direct correlation between seismicity and proximity to UIC wells completed in the Arbuckle formation due to its inherently high permeability (OGS, 2015). However, researchers contend that high-volume wastewater injection into the Arbuckle is the likely cause of recent induced seismicity due to one of two possible processes (Ellsworth et al., 2013; Walsh and Zoback, 2015; Weingarten et al., 2015). The first involves a direct hydrological connection to a pre-existing fault, where a fault slips when high-volume wastewater injection fluids increase pore pressure in the target formation and fluids reach an existing fault (typically through a highly permeable formation). Alternatively, increased fluid injection above an existing fault can change the normal or shear stresses acting on the fault, which could cause fault failure without needing a direct hydrologic connection. The former scenario, increasing the effective pore pressure, can cause a fault to fail at a significant distance from the point of injection (Ellsworth, 2013).

In response to increased seismicity in the region, the Oil and Gas Conservation Division (OGCD) of the OCC initiated actions to mitigate induced seismicity. On March 7, 2016, the OCC reduced the wastewater disposal volume to 40 percent of 2014 injection levels in an Area of Interest that overlaps the MIDSHIP Project's Chisholm Lateral and the northern portion of the Mainline in central and western Oklahoma (Oxford, 2016). The injection volume reduction was expected to generally lessen the number and magnitude of induced earthquakes in the area (Langenbruch and Zoback, 2016). Based on earthquakes recorded in 2016, researchers concluded that the rate of earthquakes decreased, but the energy released during earthquakes increased (Yeck et al., 2017). On February 24, 2017, the OCC issued a directive that would reduce the daily volume of wastewater injection for 654 wells terminating in the Arbuckle formation (see discussion in section 4.1.4.1) with the intent of reducing the number of earthquakes similar to the decline in the number of earthquakes following the 2016 directives (Skinner, 2017). On March 1, 2017, the OGS issued a statement indicating that the rate of felt earthquakes in Oklahoma had fallen to early 2014 levels (i.e., 16 earthquakes in February 2017 compared to the peak of 106 earthquakes in July 2015) due to the OCC directives (OGS, 2017).

According to the OGCD Director in a statement released in December 2016, available research indicates that the targeted formations in the SCOOP and STACK plays produce significantly lower quantities of water when oil and gas resources are extracted compared to formations in the Area of Interest, and any anticipated seismicity would be small-scale and related to hydraulic fracturing rather than wastewater injection. In addition, the OGCD and the OGS developed guidelines that would be implemented in the event that seismic events occur within 1.25 miles (2 kilometers) of hydraulic fracturing activities in the SCOOP and STACK plays. These guidelines include implementing internal mitigation practices after an earthquake measuring 2.5 in magnitude or greater, pausing operations for at least 6 hours with a technical call between the OGCD and the well operator after earthquakes greater than magnitude 3.0, and suspending operations with an in-person technical conference between the OGCD and the well operator to determine if operations can resume after an earthquake with a magnitude of 3.5 or greater (Skinner, 2016).

The OCC has implemented strategies to reduce the volume of injected wastewater and mitigate hazards associated with induced earthquakes; however, the relation between the timing and locations of felt earthquakes and wastewater disposal activity remains uncertain. Publicly available information about the SCOOP and STACK plays suggests that high-volume water disposal will not be required; however, if

[1] A propriety geographic information systems database of energy infrastructure maintained and distributed by Hart Energy Mapping & Data Services.

activity in the SCOOP and STACK plays result in more injection wells and greater cumulative volume of injected wastewater, the potential exists that localized seismic risk may increase during the operational lifetime of the MIDSHIP Project.

In order to be proactive to stakeholder concerns, Midship Pipeline contracted Kiefner and Associates, Inc. (Kiefner) to perform a seismic risk assessment and prepare the *Susceptibility of the Midship Pipeline to Damage from Seismic Events in Oklahoma* report[2] (Seismic Report). Given the range of predicted PGAs in the project area and the increased frequency of earthquakes in Oklahoma, seismic events may occur in some project areas. The Seismic Report conducted stress modeling that estimated the highest PGA along the proposed route would be about 20 percent g. The Seismic Report concluded that although there has been a significant increase in the number and magnitude of earthquakes since 2010, there has not been a corresponding increase in the number of pipeline failures caused by earthquakes. Kiefner attributed the low rate of pipeline failures to the implementation of Pipeline and Hazardous Materials Safety Administration (PHMSA) pipeline construction safety and minimum design standards, which include specifications for pipeline wall thickness and material grade, welding, and integrity testing. Please see section 4.12 for additional details regarding project safety standards that will be implemented. In addition, a study of gas transmission pipeline performance during seismic events in southern California conducted by O'Rourke and Palmer (1994, 1996) concluded that modern gas pipelines in good condition perform well during seismic events and are able to withstand ground waves caused by earthquakes and a moderate extent of permanent deformation. The study of the 1994 Northridge earthquake concluded that 91 percent of all pipeline damage due to traveling ground waves occurred in areas where the earthquake intensity exceeded a Modified Mercalli Intensity of VIII (an approximate 7.0-magnitude event) (O'Rourke and Palmer, 1994).

Based on stress modeling conducted and described in the Seismic Report, PHMSA pipeline construction safety standards, and studies conducted by O'Rourke and Palmer (1994, 1996), these seismic events are not anticipated to affect a modern arc-welded pipeline.

4.1.4.2 Active Faults

A fault is a fracture or fracture zone between two blocks of rock where movement has occurred relative to each side of the fracture. Fault movement can occur rapidly during an earthquake or slowly as a result of fault creep, and displacement along a fault can range from inches to tens of feet, depending on the earthquake magnitude. For a fault to be considered active, displacement must have taken place in the last 10,000 years (USGS, 2006).

The USGS completed several studies to identify Quaternary faults (1.6 million years or younger) and other tectonic structures in Oklahoma, and compiled the results into a database of Quaternary faults, liquefaction features, and other potential structural features (USGS, 2006). In addition, the OGS compiled a database of faults identified in Oklahoma from oil and gas industry data (Marsh and Holland, 2016). Figure 4.1.4-1 shows the locations of identified faults relative to the project, and table 4.1.4-2 summarizes the number of faults crossed by the project facilities categorized by class. None of the faults crossed by the project have documented movement in the last 10,000 years and are, therefore, considered inactive. The west-northwest trending faults crossed by the project are likely related to the uplift that occurred during the Pennsylvanian period during formation of the Anadarko Basin. In addition, according to a recent study that mapped the distribution of earthquakes greater than or equal to magnitude 2.9 and documented faults in north-central Oklahoma, the occurrence of earthquakes greater than or equal to magnitude 2.9 did not appear to correlate with known faults (Walsh and Zoback, 2016). As described in section 4.1.4, increased pore pressure can cause fault failure at a far distance from the point of injection; therefore, although faults that would be crossed by the project have not been active for the past 10,000 years, if high-volume

[2] Midship Pipeline's ***Susceptibility of the Midship Pipeline to Damage from Seismic Events in Oklahoma*** can be accessed online at https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20170605-5218

wastewater injection increases pore pressure that reaches the existing faults, it is possible that the fluids may cause the pre-existing faults to fail and generate earthquakes.

TABLE 4.1.4-2

Faults Crossed by the MIDSHIP Project[a, b]

Facility	Class A	Class B	Class C	Class D
Pipeline Facilities				
Mainline	10	53	23	31
Chisholm Lateral	0	0	1	0
Velma Lateral	0	7	5	7
Aboveground Facilities				
Tatums Compressor Station	0	0	1	0
TOTAL	**10**	**60**	**30**	**38**

Source: Marsh and Holland (2016)

[a] Class A represents faults that were "mapped using 3-D seismic techniques or mapped at the surface."
Class B represents faults that are "good quality, mapped using 2-D seismic methods with well data or are concealed surface features."
Class C rating is used when "the fault is inferred using dense well control but cannot be confidently represented."
Class D is used for "very low confidence and poor quality representation of known features."

[b] No other aboveground facilities are in areas with identified faults.

4.1.4.3 Soil Liquefaction

Soil liquefaction is a process whereby earthquake shaking or other rapid loading reduces the strength and stiffness of a saturated sandy soil. The result is a transformation of soil to a liquid state. Typically, a combination of the following three factors is necessary for liquefaction to occur:

- Loose, granular soil materials – The presence of non-cohesive sands and silts with very low or no clay content, naturally deposited (beach or river deposits, windblown deposits), or man-made land (hydraulic fill, backfill).

- Shallow groundwater/saturation of the soil materials – In saturated ground, the space between individual particles is completely filled with water. The water pressure on the particles increases during ground shaking and can overcome the overburden pressure and result in liquefaction. Deposits with a high susceptibility to liquefaction are most commonly found near bodies of water such as rivers, lakes, bays, oceans, and wetlands.

- Severe shaking – The potential for liquefaction depends on the amplitude and duration of shaking at the site. Higher magnitude earthquakes produce longer duration shaking and higher ground motion amplitudes, which result in a higher liquefaction potential.

According to the Seismic Report, there have been at least two documented cases of soil liquefaction in Oklahoma associated with the magnitude 5.6 earthquake in September 2016. The areas where liquefaction occurred were close to the Arkansas River and about 6.0 miles from the epicenter. Reportedly, PGA in the vicinity of the liquefaction features was about 32 percent g or greater.

Deposits of loose, granular, and saturated sediments can be found along the proposed pipeline routes in alluvial soils occurring along waterbodies and wetlands. As described in section 4.1.4.1, the USGS maximum predicted PGA for induced and naturally occurring seismicity is 30 and 40 percent g, respectively. However, modeling described in the Seismic Report estimated the highest PGA along the proposed route would be about 20 percent g, and any stress due to ground motion would not likely affect

the pipelines' integrity. Given the range of predicted PGAs in the project area, the increased frequency of earthquakes in Oklahoma, and recorded liquefaction events from the 2016 earthquake, there is a low potential for soil liquefaction to occur in some project areas. However, based on stress modeling described in the Seismic Report, studies by O'Rourke and Palmer (1994, 1996), and our experience with natural gas pipelines, we conclude these liquefaction events are not anticipated to affect a modern arc-welded pipeline.

4.1.4.4 Landslides

Landslides are defined as the downslope movement of soil, rock, and organic materials induced by gravity, and include but are not limited to rock falls, debris flows, and slumps. Common landslide triggers include earthquakes, heavy rains, volcanic eruptions, erosion, or human activities, and landslides are more likely to occur in areas with steep slopes and soils that shrink or swell due to changes in moisture content. Landslide hazards are often assessed by evaluating landslide incidence, areas where landslides have occurred in the past, and by evaluating landslide susceptibility, areas where previous landslides are susceptible to future movement. Susceptibility to landslides is rated from low to high, based on the percent of an area affected by landslides:

- low (less than 1.5 percent of the area affected by landslides);
- moderate (1.5 to 15 percent of the area affected); and
- high (greater than 15 percent of the area affected).

The proposed project crosses an area of moderate susceptibility and low landslide incidence between about MPs 163 to 192; however, the remaining portions of the Mainline, Chisholm Lateral, Velma Lateral, and Tie-in Piping are within areas of low susceptibility and low landslide incidence (USGS, 2005, 2017d). According to the OGS, most landslides occur in the more humid environments of eastern Oklahoma in areas of steep, mountainous terrain where precipitation is relatively greater than other parts of the state. The project is in an area with relatively less precipitation and gentle slopes, and the OGS does not consider the Quaternary terrace deposits in the project area as landslide hazards (OGS, 2008). As such, we consider the potential hazard from landslides in the project area to be low.

4.1.4.5 Flash Flooding

Flash floods result from significant rapid increases in water volume and flow rate within waterbodies and onto adjacent floodplains. A flash flood follows heavy or excessive rainfall in a short period of time, generally less than 6 hours. Flash floods are more common in the western United States because the soil is generally dry, sandy, and unable to absorb large amounts of water in a short period of time. Heavy precipitation events can fill dry stream and river beds quickly, sending significant volumes of water downstream and are typically associated with Federal Emergency Management Agency (FEMA) floodplains.

Pipeline construction within mapped FEMA 100-year floodplains would not alter floodplain contours because the pipelines would be installed below the ground surface and the topographic contours would be restored to preconstruction elevations. Flash flooding may occur at stream crossings within the project area. Midship Pipeline would install the pipeline using the HDD method for 14 of the stream crossings, and install the remaining stream crossings a minimum of 5 feet below the streambed, or a minimum of 18 inches if constructing through bedrock, mitigating the risk of flash flooding effects such as stream scour. No aboveground facilities would be within FEMA 100-year floodplains; thus, we conclude it is unlikely that aboveground facilities would be adversely affected by flash flooding.

4.1.4.6 Karst Topography

Karst features form as a result of dissolution of carbonate bedrock (e.g., limestone, dolomite) along fractures and bedding planes due to percolating acidic rainwater that mixes with groundwater. In Oklahoma, the area encompassing the Arbuckle Mountains is the closest potential karst terrain to the project area. Based on review of information from the OGS, the project would cross areas of potential karst topography where limestone is present between MPs 120 and 150, MPs 160 and 180, and MP 190 to the end of the Mainline. In addition, gypsum and other evaporite deposits that may form pseudokarst features are located near the surface and would be crossed by the Mainline between about MPs 0 and 40. Midship Pipeline calculated each pipeline's maximum ability to span between supports and determined that the Velma Lateral has a span capacity between 42 and 52 feet, the Chisholm Lateral has a span capacity between 68 and 75 feet, and the Mainline has a span capacity between 78 and 100 feet depending on the pipeline wall thickness.

Midship Pipeline prepared a *Karst Mitigation Plan* that includes engineered mitigation options in the event that karst is encountered during construction and re-routing or avoidance of karst is not feasible (see appendix H). We reviewed the *Karst Mitigation Plan* and consider it to be adequate. With the implementation of measures in the *Karst Mitigation Plan* and FERC's Plan and Procedures (which would minimize erosion potential and direct water away from the project area), we conclude the project would not adversely affect karst terrain.

4.1.5 Paleontological Resources

Paleontological resources, including plant, vertebrate, and invertebrate fossils, are sometimes discovered at locations under excavation or exposed by erosion. Typically, fossils are found in bedrock; therefore, areas with shallow bedrock may have the greatest potential for containing paleontological resources. Direct effects on paleontological resources could occur during project construction by activities such as grading or trenching. Indirect effects on fossil beds could result from erosion caused by slope regrading, vegetation clearing, and/or unauthorized collection. The Antiquities Act of 1906 and the Paleontological Resources Preservation Act of 2009 protect objects of antiquity and fossils, respectively, on federal lands. No such protection for paleontological resources exists for non-federal lands. No federal lands would be crossed by the project.

Between about MPs 130 and 163, the Mainline route would cross the Cretaceous-aged Antlers sandstone, which has been documented to contain petrified wood (Arkansas Geological Survey, 2017). There is also the potential for dinosaur bones to be encountered in the Antlers sandstone formation (TRC, 2016). In addition, the project would cross the Cretaceous-aged Kiamichi formation between about MPs 163 and 174, which comprises dense, dark gray shale interbedded with fossiliferous limestone beds packed with oyster shells.

Prior to construction, Midship Pipeline would train contractor personnel to recognize fossils during construction and, if a fossil is discovered, report the discovery to the landowner and abstain from collecting fossils. With implementation of these measures, we conclude that the project would not adversely affect paleontological resources.

4.1.6 General Impacts and Mitigation

The project's effect on surface geology would be minor because the effects would be limited to construction activities and temporary disturbance of surficial geologic materials within the right-of-way. Midship Pipeline would minimize the impact on surficial geology by restoring topographic contours to preconstruction conditions in areas of temporary disturbance. In the areas where aboveground facilities

would be constructed, grading and filling may be required; however, these activities would result in minor permanent impacts on surface geology.

Blasting

Midship Pipeline anticipates that blasting and rock removal may be required as part of construction activities in areas of shallow bedrock. Blasting activities could potentially affect water wells, springs, nearby aboveground facilities, and adjacent pipelines and utility lines. Potential impacts on water wells and springs are addressed in section 4.3.1. Midship Pipeline would conduct pre- and post-construction water quality and yield testing for wells and springs identified within 150 feet of the project workspace. In the event that a water well or spring is damaged or is otherwise adversely affected by blasting, Midship Pipeline would repair the well or spring (or compensate the landowner for damages) and provide an alternative potable water source until the repairs are complete. Any required blasting would be conducted in accordance with applicable federal, state, and local regulations.

Midship Pipeline prepared a *Blasting Plan* (see appendix I) that describes the measures it would follow during blasting operations. As described in the *Blasting Plan*, Midship Pipeline would:

- require its construction contractor to submit a detailed blasting specification plan that is consistent with the project *Blasting Plan* for Midship Pipeline's review and approval;
- contact landowners and occupants of nearby buildings, residences, businesses, and public gathering spaces at least 48 hours prior to blasting;
- request authorization from landowners to inspect aboveground and underground facilities within 150 feet of blasting activities before and after blasting;
- survey the proposed blasting zone for sensitive habitats or species before and after drilling or blasting and stake the identified areas;
- use seismograph equipment to monitor the velocity of the blasts at all structures, pipelines, and potable water wells within 150 feet of blasting activities (peak particle velocity would not exceed 4 inches per second for underground pipelines and structures and 1.5 inches per second for aboveground structures and water wells);
- use blasting mats or padding where necessary to prevent the scattering of loose rock and other debris and damage to nearby overhead lines or structures; and
- design the site-specific blasting pattern to produce blast rock material suitable for backfill (i.e., less than 3 inches in diameter unless approved by Midship Pipeline). If blast rock leaves the right-of-way despite blast mats or padding, the material will be collected immediately and transported to an approved disposal site.

We have reviewed Midship Pipeline's *Blasting Plan* and conclude that it is acceptable. Impacts on geologic resources and nearby residences and facilities would be avoided or adequately minimized by following the project-specific *Blasting Plan* and applicable federal, state, and local regulations.

Mineral Resources

There are 587 active oil and gas wells and 1 active mine within 0.25 mile of the proposed project. None of these oil and gas wells are within the proposed workspace for the project; however, 53 of the wells are within 150 feet of the proposed workspace. Midship has committed to continuing to work with landowners and well operators to identify oil and gas well locations. If a previously unidentified oil or gas well is encountered within the workspace prior to construction, Midship Pipeline would coordinate with the landowner to avoid the well and report the well to the OCC. Any pipeline route variations that require new workspace would require FERC approval.

Seismicity

As noted in section 4.1.4.1, we received comments expressing concern about pipeline safety due to the recent trend of increased frequency and magnitude of induced earthquakes. According to the Seismic Report, the potential for soil liquefaction in the project area is very low, and the models indicate that stresses on the pipeline associated with earthquake ground wave propagation are within acceptable limits. In addition, modern gas transmission pipelines have been shown to perform well in seismically active areas (O'Rourke and Palmer, 1994, 1996). The pipeline and associated facilities would be designed and constructed in accordance with applicable DOT regulations (49 CFR 192) and applicable federal and state standards and design requirements, which would allow the project facilities to withstand probable seismic hazards. Finally, the Seismic Report concludes that the increased frequency and magnitude of earthquakes has not caused an increase of pipeline failures in Oklahoma based on PHMSA pipeline incident data. Therefore, we conclude seismic hazards would be minor.

4.2 SOILS

4.2.1 Existing Soil Resources

The descriptions and characteristics of soils discussed in this section were compiled from a variety of data sources including soil surveys and website databases published and maintained by the NRCS. Websites used include the NRCS Official Series Description and Web Soil Survey (Soil Survey Staff, 2017a, 2017b).

Soils within the project area were mapped using the NRCS digital SSURGO database, which includes geospatially referenced Geographic Information System (GIS) soil map unit polygons at a scale of 1:24,000. SSURGO data contain the most detailed level of soil mapping performed by the NRCS, and correspond with or supersede the original county soil survey mapping.

4.2.1.1 Pipeline Facilities

Soils along the proposed pipeline segments were evaluated to identify prime farmland and major soil characteristics that could affect construction or increase the potential for construction-related soil impacts. The soil characteristics evaluated were prime farmland, hydric soils, compaction-prone soils, erosion potential, soils with poor revegetation potential, shallow bedrock, and rocky soils. Additional soil-related impacts could include disruption of agricultural drainage or irrigation systems and impacts on soils from an inadvertent release of fuel or fluids during construction. Table 4.2.1-1 summarizes the significant soil characteristics that would be crossed by the pipeline facilities. Individual soil characteristics and the potential mitigation measures that Midship Pipeline would employ are described below.

TABLE 4.2.1-1

Summary of Soil Characteristics Affected by the MIDSHIP Project (acres) [a, b]

Facility/County	Total Acres	Prime Farmland [c]	Hydric Soils [d]	Compaction Prone [d]	Highly Water Erodible [e]	Highly Wind Erodible [f]	Revegetation Concerns [g]	Shallow Depth to Bedrock [h]	Rocky Soils [i]
Pipeline Facilities [j]									
Mainline Pipeline	2,640.7	1,419.6	207.4	0.0	578.5	66.8	9.6	979.4	377.0
Chisholm Lateral	272.6	188.5	0.0	0.0	118.8	0.0	0.2	227.5	0.0
Velma Lateral	135.0	84.3	12.4	0.0	2.3	148.0	2.3	75.3	38.4
Tie-in Piping	1.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	**3,048.9**	**1,693.5**	**219.8**	**0.0**	**699.6**	**81.6**	**12.2**	**1,282.2**	**415.4**
Aboveground Facilities [j]									
Compressor and Booster Stations	98.9	88.9	3.3	0.0	0.0	23.5	0.0	11.2	1.4
Meter Stations	17.3	15.1	2.5	0.0	6.3	0.0	0.0	9.3	1.5
Subtotal	**116.2**	**103.9**	**5.8**	**0.0**	**6.3**	**23.5**	**0.0**	**20.5**	**2.9**
Ancillary Facilities									
Access Roads	111.4	42.4	7.2	0.0	14.6	4.1	0.4	72.2	24.4
Contractor Yards	63.5	60.2	16.9	0.0	52.0	0.0	52.0	12.5	0.0
Subtotal	**174.9**	**102.6**	**24.1**	**0.0**	**66.6**	**4.1**	**0.4**	**84.7**	**24.4**
TOTAL	**3,340.7**	**1,900.1**	**249.6**	**0.0**	**772.4**	**109.2**	**12.6**	**1,387.4**	**442.7**

Sources: Soil Survey Staff, 2017a, 2017b

a The area affected includes the permanent pipeline right-of-way, temporary workspace, and ATWS.

b The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends. The values in each row do not add up to the total acreage for each county because the soils may occur in more than one characteristic class or may not occur in any class listed in the table.

c As designated by the NRCS. Prime farmland includes those soils that are considered prime if a limiting factor is mitigated (e.g., through artificial drainage), farmland of statewide importance, and farmland of local importance.

d Soils with a poorly to very poorly drained classification. Based on the 1:24,000 scale of the SSURGO mapping, poorly or very poorly drained soils may be inclusions within the mapped soil unit, are not represented in the data, but may still be compaction prone.

e Soils with a K factor value of 0.40 to 0.69.

f Soils with a wind erodibility group classification of 1 or 2.

g Revegetation potential is determined by three parameters: drainage class, K factor, and slope. Each parameter is assigned a value of 1, 2, or 3, then averaged. Excessively drained and very poorly drained soils are designated low (1); somewhat excessively drained and poorly drained soils are designated moderate (2); and well-drained, moderately well-drained, and somewhat poorly drained soils are designated high (3). Soils with a K factor of 0.40 to 0.69 are designated low (1), 0.20 to 0.40 are designated moderate (2), and 0.20 to 0.02 are designated high (3). Soils with slopes of 25 percent or more are designated low (1), 8 to 25 percent are designated moderate (2), and slopes of less than 8 percent are designated high (3). The average of these three scores determines the overall low, moderate, or high revegetation potential, where 1.0 to 1.7 is Low; 1.8 to 2.3 is Moderate; and 2.4 to 3.0 is High. Soils with a Low revegetation potential are soils with revegetation concerns.

h Soils containing bedrock within 60 inches of the soil surface.

i Soils with one or more horizons that have a cobbley, stony, bouldery, channery, or flaggy modifier to the textural class and/or contain greater than 5 percent by weight rocks larger than 3 inches; and where these rocky horizons make up at least 50 percent of the soil profile.

j MLVs, receipt taps, and pig launchers and receivers are included in their associated pipeline or aboveground facilities.

Prime Farmland

The USDA defines prime farmland as "land that is best suited to food, feed, fiber, and oilseed crops." This designation includes cultivated land, pasture, woodland, or other lands that are either used for food or fiber crops or are available for these uses. The fact that a particular soil is considered prime farmland does not mean that it is currently in agricultural use; some prime farmland soils may be in forested, open, or residential areas. Urbanized land and open water are excluded from prime farmland. Prime farmland typically contains few or no rocks, is permeable to water and air, is not excessively erodible or saturated with water for long periods, and is not subject to frequent, prolonged flooding during the growing season. Soils that do not meet the above criteria may be considered prime farmland if the limiting factor is mitigated (e.g., artificial drainage). About 1,900.1 acres (57 percent) of the soils along the proposed pipeline segments are considered prime farmland.

Hydric Soils and Compaction Potential

Hydric soils are defined as "soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (Federal Register, 1994). Soils that are artificially drained or protected from flooding (e.g., by levees) are still considered hydric if the soil in its undisturbed state would meet the definition of a hydric soil. Generally, hydric soils are those soils that are poorly and very poorly drained. Hydric soils may indicate the presence of wetlands. Wetland areas containing hydric soils were delineated within the entire project area as described in section 4.4.1. Due to extended periods of saturation, hydric soils can be prone to compaction and rutting. In addition, high groundwater levels associated with hydric soils could create a buoyancy hazard for the pipeline.

Soil compaction modifies the structure and reduces the porosity and moisture-holding capacity of soils. Construction equipment traveling over wet soils could disrupt the soil structure, reduce pore space, increase runoff potential, or cause rutting. The degree of compaction was evaluated based on soil drainage class. Soils that are very poorly drained or poorly drained were classified as having a high potential for compaction, soils that are somewhat poorly drained to moderately well drained were classified as having a moderate potential for compaction, and soils that are well drained to excessively drained were classified as having a low potential for compaction.

About 249.6 acres (7 percent) of the soils along the proposed pipeline segments are considered hydric. Special construction procedures within wetlands are described in sections 2.3.2 and 4.4.3 and addressed in the Procedures.

Soil Erosion

Erosion is a continuing natural process that can be accelerated by human disturbance. Factors such as soil texture, structure, slope, vegetation cover, rainfall intensity, and wind intensity can influence the degree of erosion. Soils most susceptible to erosion by water are typified by bare or sparse vegetation cover, non-cohesive soil particles with low infiltration rates, and moderate to steep slopes. Soils typically more resistant to erosion by water include those that occupy low relief areas, are well vegetated, and have high infiltration capacity and permeability. Wind erosion processes are less affected by slope angles than water processes. Wind-induced erosion often occurs on dry soil where vegetation cover is sparse and strong winds are prevalent.

The potential for soils in the project area to be eroded by water was evaluated based on the K factor. The K factor represents a relative quantitative index of the susceptibility of bare soil to particle detachment and transport by water. K factor values are primarily based on soil texture, although organic matter content, structure size class, and permeability are also pertinent factors. The higher the K factor value, the more

susceptible the soil is to water erosion (NRCS, 2017a). Based on the K factor, each soil type was grouped into a water erosion class of Low, Moderate, or High. Low K values ranged from 0.02 to 0.20, moderate K values ranged from 0.20 to 0.40, and high K values ranged from 0.40 to 0.69. For map units containing multiple soil types, the soil type with the most limiting average K factor was used to categorize the map unit into a Low, Medium, or High class. Based on this analysis, about 772.4 acres (23 percent) of the proposed pipeline routes are highly water erodible.

Susceptibility to wind erosion was evaluated based on the wind erodibility group (WEG) as designated by the NRCS. WEG is a grouping of soils that have similar surface-soil properties affecting their resistance to soil blowing, including texture, organic matter content, and aggregate stability. WEGs may range from 1 to 8, with 1 being the highest potential for wind erosion, and 8 the lowest. Based on this analysis, about 109.2 acres (3 percent) of the proposed pipeline routes are highly wind erodible.

Revegetation Potenial

Soil water content can affect germination and eventual establishment of new vegetation by creating unfavorable conditions for plants. Excessively drained and very poorly drained soils were considered to have low revegetation potential, somewhat excessively drained and poorly drained soils were considered to have moderate revegetation potential, and well drained, moderately well drained, and somewhat poorly drained soils were considered to have high revegetation potential. Erodible soils can remove prepared seedbeds and affect revegetation success. Soils with low water erodibility potential were considered to have high revegetation potential, soils with moderate water erodibility potential were considered to have moderate revegetation potential, and soils with high water erodibility were considered to have low revegetation potential. In addition, steep slopes along the proposed pipeline routes may make the reestablishment of vegetation difficult. Soils with slopes of 25 percent or more were considered to have low revegetation potential, soils with slopes of 8 to 25 percent were considered to have moderate revegetation potential, and soils with slopes of less than 8 percent were considered to have high revegetation potential. These factors were combined and averaged in order to determine the revegetation potential of a soil map unit.

About 12.6 acres (less than 1 percent) of the soils along the proposed pipeline segments are soils with a revegetation concern.

Shallow Bedrock and Rocky Soils

Bedrock may be encountered when the depth of trench excavation exceeds the soil cover. Introducing stones and other rock fragments to surface soil layers may reduce soil moisture-holding capacity, resulting in a reduction of soil productivity. Additionally, some agricultural equipment may be damaged by contact with large rocks and stones. Rock fragments at the surface and within the soil profile may be encountered during grading, trenching, and backfilling. Construction through soils with shallow bedrock or rocky soil profiles could result in the incorporation of bedrock fragments into surface soils.

The potential for introducing rock into the topsoil was evaluated based on bedrock depth and the presence of a rocky soil profile. SSURGO data were used to identify soil map units where depth to bedrock is generally anticipated to be less than 5 feet (60 inches) from the soil surface or include one or more soil horizons that have a cobbley, stony, bouldery, channery, or flaggy modifier to the textural class and/or contain greater than 5 percent by weight rocks larger than 3 inches.

About 1,387.4 acres (42 percent) of soils that would be affected along the proposed pipeline segments have shallow depth to bedrock. About 442.7 acres (13 percent) of soils that would be affected along the proposed pipeline segments have a rocky soil profile.

4.2.1.2 Aboveground Facilities

Table 4.2.1-1 summarizes the significant soil characteristics that would be affected by the proposed aboveground facilities. Construction of the compressor/booster stations and meter stations would affect about 116.9 acres of soil, of which about 81.1 acres would be permanently converted for industrial use (see sections 2.2.4 and 4.8.1). Operation of the compressor/booster stations and meter stations would permanently affect 70.4 acres of prime farmland. About 19.6 acres of land currently in agricultural use would be permanently converted for operation of these facilities (see section 4.8.4).

4.2.1.3 Contractor Yards

Midship Pipeline has identified three temporary contractor yards that would be used during construction. Use of the contractor yards would temporarily affect about 63.5 acres of land. If necessary, rough grading and vegetation clearing of temporary contractor yards would be conducted. Areas used for contractor yards would be restored after construction in accordance with landowner lease agreements. Therefore, the project would not have significant impacts on soils in the contractor yards and staging areas.

4.2.1.4 Access Roads

Midship Pipeline has identified a total of 91 temporary access roads and 25 permanent access roads that would be used for construction and operation of the project. Of the 36.3 miles of proposed access roads, about 1.9 miles are locations that would require new construction within open (including existing utility corridors) or agricultural land. Most roads proposed for use would require minor improvements (e.g., grading, addition of gravel, trimming of tree limbs) to allow for passage of construction vehicles. Temporary access roads would be restored to preconstruction conditions following completion of construction and restoration. Midship Pipeline would maintain permanent access roads for the life of the respective facility. Access roads (including temporary and permanent) would occupy a total of 111.4 acres of land, of which 6.5 acres would be associated with the permanent access roads (see appendix E). No significant impacts on soils in the temporary or permanent access roads would occur.

4.2.2 General Impacts and Mitigation

Construction activities, such as clearing, grading, trench excavation, backfilling, and the movement of construction equipment along the right-of-way may affect soil resources. Clearing removes protective vegetation cover and exposes the soil to the effects of wind and rain, which increases the potential for soil erosion and sedimentation of sensitive areas. Grading, spoil storage, and equipment traffic could compact soil, reducing porosity and increasing runoff potential. Excess rock or fill material brought to the surface during trenching operations could hinder restoration of the right-of-way.

To reduce the effects of construction on soils, Midship Pipeline and its contractors would implement the Plan and Procedures, which identify baseline mitigation measures to minimize soil disturbance and transportation of sediments off the right-of-way or into sensitive resources (e.g., wetlands, streams, residential areas). The Plan and Procedures represent best management practices and are designed to accommodate varying field conditions while maintaining strict minimum standards for the protection of soil resources and environmentally sensitive areas.

4.2.2.1 Prime Farmland

Construction activities such as clearing, grading, and equipment movement can result in soil compaction and increased susceptibility to erosion. The loss of topsoil from erosion or the mixing of topsoil with the subsoil during construction could result in a loss of soil fertility and impaired revegetation.

Drain tiles are subsurface structures used in some agricultural areas to improve the productivity of the land by increasing drainage of the soils. Drain tile damage could occur by operation of heavy construction equipment causing rutting in wet soils, and during excavation of the pipeline trench. Midship Pipeline would consult with landowners prior to construction to identify and/or repair any drain tiles or irrigation systems that would be affected by the project.

We received a comment regarding the potential impacts on agricultural land, including topsoil, soil compaction, wind and water erosion, maintaining natural ground contours, and pipeline depth of cover in areas where deep tillage is practiced. To maintain soil fertility in agricultural lands temporarily affected by construction activities, Midship Pipeline would:

- segregate up to 12 inches of topsoil from the ditch line and spoil storage area and store separately from the subsoil to maintain surface horizons with higher organic matter content;
- backfill rock fragments to only the top of the natural bedrock profile (excess fragments would be removed from the workspace or disposed of in locations approved by the landowner and would not interfere with agricultural activities);
- test topsoil and subsoil for compaction at regular intervals (severely compacted topsoil would be plowed to decrease bulk density and improve soil structure);
- bury the pipeline with a minimum of 4 feet of cover in croplands;
- install and maintain temporary and permanent erosion controls (e.g., silt fence, slope breakers, trench plugs) in accordance with the Plan and Procedures and return ground contours and drainage patterns as close to original conditions as practicable; and
- where drain tiles would be crossed, maintain flow to the drainage system during construction. Drain tile systems would be probed within the area of disturbance to determine if any damage occurred during construction. Any damage to or temporary manipulation of a drain tile system would be repaired to a level of function that meets or exceeds the original condition.

With the implementation of these measures, we do not expect that construction or operation of the project would result in significant impacts on prime farmland.

4.2.2.2 Hydric Soils and Compaction Potential

Poor and very poorly drained soils are prone to compaction and structural damage if disturbed due to permanent or frequent saturation at or near the soil surface (see section 4.2.1.1). The Procedures provide detailed descriptions of wetland and waterbody crossing techniques designed to minimize damage to saturated soils, as well as other soils that may be vulnerable to such damage when wet. Wetland and waterbody construction methods are described in sections 2.3.2, 4.3.2.5, and 4.4.3. Measures to mitigate effects on wetlands and waterbodies during construction and operation of the project are described in sections 4.3.2.6 and 4.4.4.

To the extent practicable, Midship Pipeline would avoid construction during periods of soil saturation. Topsoil would be segregated in wetlands (unless standing water or saturated soils are present) and residential areas and then later returned as the surficial layer. Timber mats would be used to minimize rutting and compaction within saturated wetland soils. Grading to restore natural site contours and repair

rutted areas would be completed before final revegetation, seeding, and mulching, which would help initiate natural restoration of soil structure and bulk density.

4.2.2.3 Soil Erosion

Midship Pipeline would implement the measures specified in the Plan and Procedures to avoid or minimize potential effects of soil erosion and sedimentation. As outlined in the Plan and Procedures, Midship Pipeline would have an EI monitor all phases of construction to verify that project plans are followed and would use erosion control devices and construction practices to minimize erosion during and after construction. Midship Pipeline would be required to employ at least three EIs per construction spread (two construction spreads are anticipated). Wetland and waterbody crossings would be designed to minimize erosion. At the end of construction, Midship Pipeline would return surface contours and drainage patterns as close to original conditions as practicable and would reestablish vegetation as soon as possible following final grading. Midship Pipeline would inspect the right-of-way and maintain erosion and sediment controls as necessary until final stabilization is achieved. Once revegetation is satisfactory, temporary erosion control measures would be removed. With implementation of these measures, we conclude significant soil erosion would not occur during construction or operation of the project.

4.2.2.4 Post-Construction Revegetation

Most of the soils along the proposed pipeline segments typically exhibit characteristics sufficient for successful revegetation; where limitations exist, Midship Pipeline would attempt to overcome them by implementing appropriate best management practices. Standard revegetation measures include fertilizer and pH amendments (except in wetlands), seedbed preparation, use of a proven seed mix, consideration of seasonal constraints, and mulch application. As required by the Plan, Midship Pipeline would seed disturbed areas in accordance with written recommendations for seed mixes, rates, and dates obtained from the local soil conservation authority or at the request of the landowner or land management agency. Where necessary, erosion control fabric or matting would be used on steep slopes to ensure that soils successfully revegetate. Midship Pipeline would monitor all disturbed areas for a minimum of two growing seasons after construction to evaluate revegetation success in accordance with the Plan. Areas that have not revegetated successfully Midship Pipeline would correct to ensure the right-of-way conditions are similar to the surrounding undisturbed areas.

Based on previous experience with revegetation of pipeline facilities, and with adherence to the protocols outlined in the Plan and Procedures, we do not anticipate significant issues with successful revegetation.

4.2.2.5 Shallow Bedrock and Rocky Soils

Areas of soils with shallow bedrock and/or rocky soils would be encountered throughout the project area. As a result, Midship Pipeline anticipates that rock excavation and/or rock blasting would be necessary during construction activities.

The introduction of subsoil rocks into agricultural topsoil would be minimized by segregating topsoil from trench spoil and replacing topsoil in agricultural areas after cleanup. Midship Pipeline would remove excess rock from surficial soils in cultivated and rotated croplands, hayfields, pastures, residential areas, and at the landowner's request in other areas so that the size, density, and distribution of rock on the construction right-of-way would be similar to adjacent non-right-of-way areas. Midship Pipeline would not remove rocks from backfilled areas if the rock in the backfill is consistent in size and density with conditions in adjacent undisturbed areas. If bedrock is encountered, Midship Pipeline would take precautions to minimize the mixing of excavated bedrock with backfill and would replace rock in the trench to a level that is not higher than the original bedrock profile. Where blasting is required, Midship Pipeline

would use the minimum explosive charge necessary to fracture bedrock and minimize shot-rock from leaving the construction right-of-way (see section 4.1.6). Where necessary, excess rock would be hauled off the right-of-way as construction debris or left on the right-of-way for beneficial reuse, subject to landowner approval and applicable permit conditions. Through adherence of these measures, we conclude that the project would not result in a significant increase in the rock content of topsoil in residential or agricultural areas.

4.2.2.6 Soil Contamination

Soil contamination in areas affected by the project could result from at least two sources: hazardous material or fuel spills during construction and/or those occurring before construction in pre-existing contaminated areas that are encountered during construction. Contamination from spills or leaks of fuels, lubricants, and coolant from construction equipment could adversely affect soils. The effects of such contamination are typically minor because of the low frequency and volumes of spills and leaks. Midship Pipeline has developed an SPRP that specifies cleanup procedures to minimize the potential for soil contamination from spills or leaks of fuel, lubricants, coolants, or solvents, and to ensure that inadvertent spills are contained, cleaned up, and disposed of as quickly as possible and in an appropriate manner. We have reviewed this plan and find it adequate.

Midship Pipeline reviewed ODEQ (2017a) and EPA (2017a and b) databases to identify potentially contaminated soils within 0.5 mile of the project area. Under the Assessment, Cleanup, and Redevelopment Exchange System (ACRES), the Mitchell 1-7 Well is registered as a brownfield property and is about 0.25 mile southwest of access road 70 and about 0.4 mile southwest of Mainline MP 102.0. The EPA conducted a Phase I assessment at the site in 2013 and determined that no contamination risks are present (EPA, 2017a). Therefore, no soil contamination from this site would be encountered during construction of the project.

In the draft EIS, we recommended that Midship Pipeline provide a plan it would implement in the event that unanticipated contamination is encountered during construction. In response, Midship Pipeline submitted the *Midship Procedure for Addressing Discovery of Unanticipated Contamination during Construction* (Unanticipated Contamination Plan), which outlines the actions that Midship Pipeline would implement to protect human health and worker safety; prevent the spread of contamination; and comply with applicable federal, state, and/or local regulations in the event that contaminated soil and/or groundwater is encountered during construction. Actions include, but are not limited to, suspending work activities and securing the area; conducting notifications to applicable federal, state, and local agencies; mobilizing emergency response personnel; sampling and documenting contamination; and collecting and disposing of contamination to an authorized facility. We have reviewed the Unanticipated Contamination Plan and find it adequate.

4.2.2.7 Conclusion

Construction and operation of the MIDSHIP Project would affect a variety of soil types. Soils in the project area are generally well drained, gently sloping, fine textured alluvium and residuum. Over half of the soils affected by the project are designated as prime farmland. Some soils, including prime farmland, would be permanently converted to industrial use for the life of the project. However, based on our experience with pipeline facilities, and with adherence to the protocols outlined in the Plan and Procedures and Midship Pipeline's SPRP and Unanticipated Contamination Plan, we conclude that potential impacts on soils would be avoided or effectively minimized or mitigated.

4.3 WATER RESOURCES

4.3.1 Groundwater Resources

4.3.1.1 Existing Groundwater Resources

The proposed MIDSHIP Project facilities would cross five aquifer systems that the Oklahoma Water Resources Board (OWRB) defines as "major aquifers" because of their capacity to produce at least 50 and 150 gallons per minute (gpm) for bedrock and alluvial aquifers, respectively.

The five major aquifers crossed by the project include:

- the North Canadian River alluvial and terrace aquifer, which is present in northwest Oklahoma and supplies drinking water for several municipalities (USGS, 1996);
- the Canadian River alluvial and terrace aquifer, which extends across central Oklahoma and is a localized water source for various purposes, although the high sulfate, chloride, and dissolved solids concentrations in certain areas prevent wide-scale use (USGS 1996);
- the Washita River alluvial and terrace aquifer; which provides water for industrial, irrigation, and municipal purposes (USGS, 1996);
- the Arbuckle-Simpson bedrock aquifer, which is found in south-central Oklahoma and consists of Cambrian- and Ordovician-aged limestone, dolomite, and sandstone. The Arbuckle-Simpson aquifer supplies public drinking water, among other uses (USGS, 1996; OWRB, 2009); and
- the Antlers bedrock aquifer, which is a Cretaceous-aged sandstone found in southeastern Oklahoma that provides water for municipal use; however, in certain wells the iron and manganese concentrations exceed the recommended limits for municipal consumption (Morton, 1992; Hart, 1981).

In addition, the project crosses two minor bedrock aquifers that, according to the OWRB, are defined as "discrete underground bodies of water overlain by contiguous land with the same geological and hydrological characteristics," but are not considered to be major aquifers. The average basin wide yield of these aquifers is less than 50 gpm. The project crosses the following minor bedrock aquifers:

- the Woodbine aquifer of southeastern Oklahoma, which is an about 350-foot-thick Cretaceous-aged sandstone interbedded with shale and lignite. The water quality ranges from poor to good, and the aquifer provides private and public drinking water and livestock water use (Wilkins, 1998); and
- the El Reno aquifer, which is generally oriented in a north-south trend through central Oklahoma, and primarily consists of Permian-aged calcareous shale and evaporites such as gypsum, dolomite, and halite. A lesser proportion of the aquifer consists of fine-grained sandstones and siltstones; however, these deposits yield most of the water in the aquifer. The El Reno aquifer supplies drinking water for small municipalities in Grady County (Belden, 2000).

Table 4.3.1-1 provides mileposts where project facilities cross each major or minor aquifer and the general characteristics of each major or minor aquifer. Figure 4.3.1-1 shows the locations of project facilities in relation to the major and minor aquifers.

TABLE 4.3.1-1

Major and Minor Aquifers Crossed by the MIDSHIP Project[a]

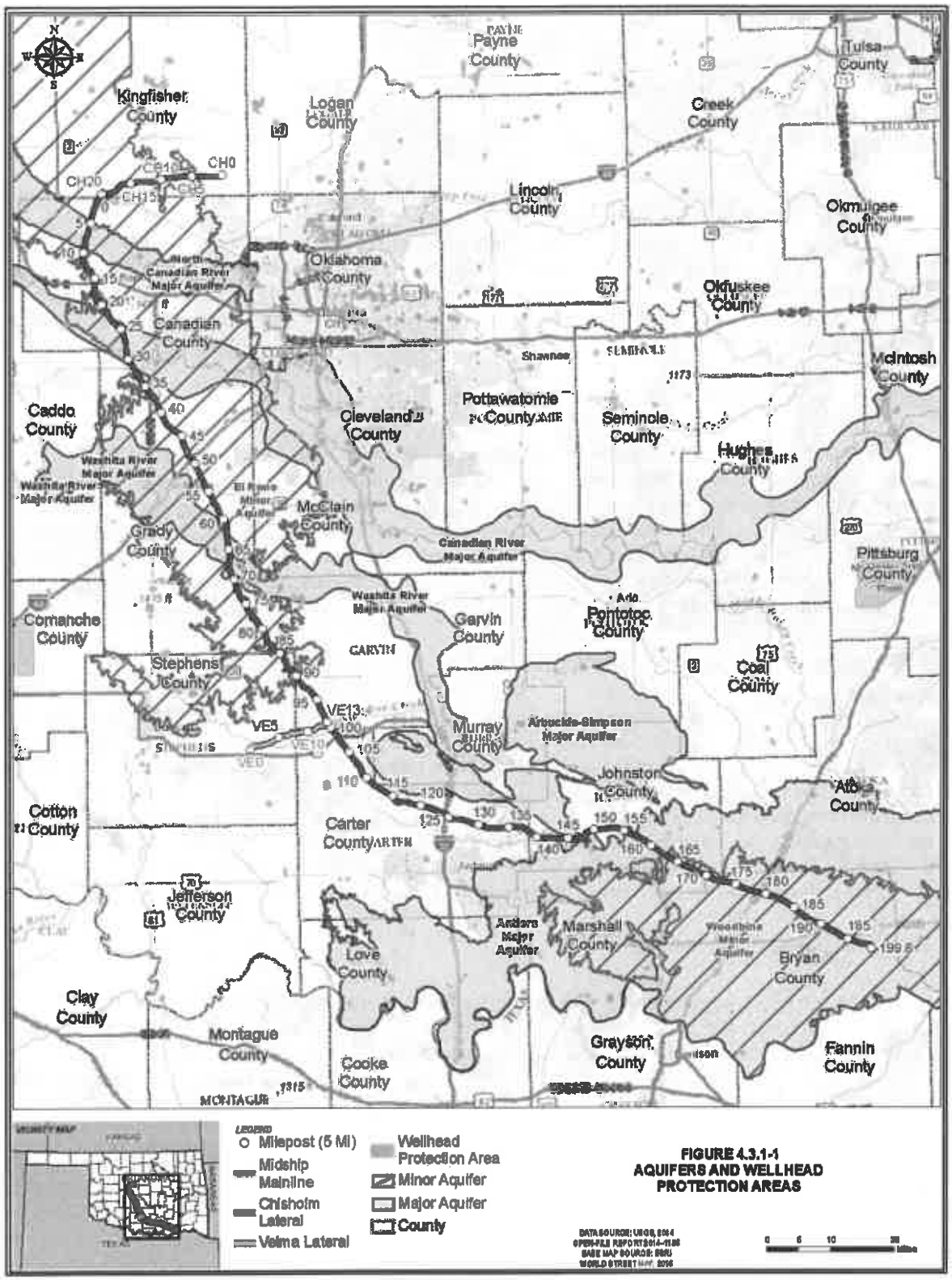
Facility	Aquifer Name and Type	Approximate Milepost	Depth to Groundwater[b] (feet)	Well Yield (gpm)
Pipeline Facilities				
Mainline	El Reno (bedrock)	0.0–13.8	40	0–800
	North Canadian River (alluvial)	4.5–9.2	20–80	1,000
	El Reno (bedrock)	15.2–15.8	40	0–800
	El Reno (bedrock)	16.8–16.9	40	0–800
	El Reno (bedrock)	18.6–31.8	40	0–800
	Canadian River (alluvial)	22.5–31.3	20	500
	El Reno (bedrock)	32.9–36.4	40	0–800
	El Reno (bedrock)	36.7–82.9	40	0–800
	Washita River (alluvial)	62.7–69.6	20	20–300
	El Reno (bedrock)	83.0–83.2	40	0–800
	El Reno (bedrock)	85.2–85.7	40	0–800
	El Reno (bedrock)	85.9–88.2	40	0–800
	Arbuckle-Simpson (bedrock)	147.2–147.6	200	25–600
	Antlers (bedrock)	148.7–150.0	50	100–500
	Antlers (bedrock)	155.2–199.6	50	100–500
	Woodbine (bedrock)	163.7–199.6	100	14–60
Chisholm Lateral	El Reno (bedrock)	CH4.3–CH5.1	40	0–800
	El Reno (bedrock)	CH10.3–CH20.4	40	0–800
Tie-in Piping	El Reno (bedrock)	TP0.0–TP0.2	40	0–800
Compressor Stations				
Bennington Compressor Station	Antlers (bedrock)	198.4	50	100–500
	Woodbine (bedrock)	198.4	100	14–60
Meter Stations				
Okarche/Mark West Meter Station	El Reno (bedrock)	0.0	40	0–800
Canadian Valley Meter Station	El Reno (bedrock)	10.6	40	0–800
Cana Meter Station	El Reno (bedrock)	15.2	40	0–800
Iron Horse Meter Station	El Reno (bedrock)	47.5	40	0–800
Grady Meter Station	El Reno (bedrock)	78.8	40	0–800
NGPL Meter Station[c]	Antlers (bedrock)	198.4	50	100–500
	Woodbine (bedrock)	198.4	100	14–60
Bennington Meter Station	Antlers (bedrock)	199.6	50	100–500
	Woodbine (bedrock)	199.6	100	14–60
Receipt Taps				
Bradley Receipt Tap	El Reno (bedrock)	74.1	40	0–800
MLVs				
MLVs 1-4	El Reno (bedrock)	36.4; 55.6; 75.5; 86.7	40	0–800
MLVs 7	Antlers (bedrock)	156.5	50	100–500
MLVs 8-9	Antlers (bedrock)	175.4; 193.5	50	100–500
	Woodbine (bedrock)	175.4; 193.5	100	14–60
Pig Launcher/Receiver				
Mainline Pig Launcher	El Reno (bedrock)	0.0	40	0–800
Mainline Pig Receiver	Antlers (bedrock)	199.6	50	100–500
	Woodbine (bedrock)	199.6	100	14–60
Chisholm Lateral Pig Receiver	El Reno (bedrock)	CH20.4	40	0–800

Source: OWRB, 1999, 2016

[a] Some project facilities do not cross any major or minor aquifers.

[b] Depth to groundwater is measured in feet below ground surface.

[c] The NGPL Meter Station is within the Bennington Compressor Station site.



4.3.1.2 Sole Source Aquifers

The EPA defines a sole source aquifer (SSA) as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer, where contamination of the aquifer could create a significant hazard to public health, and where there are no available alternative water sources that could reasonably serve as a substitute water supply for the aquifer (EPA, 2017a).

The EPA designated the eastern portion of the Arbuckle-Simpson aquifer as a SSA where it underlies sections of Johnston, Pontotoc, and Murray Counties (EPA, 1989). The project crosses the Arbuckle-Simpson aquifer where it is classified as a SSA between about MPs 147.2 and 147.6. The EPA has the authority to review projects that cross SSAs and receive federal funding to ensure that the projects do not contaminate the SSA. The project has not applied to receive federal financial assistance; therefore, the EPA SSA review requirement is not triggered for the portion of the project that crosses the Arbuckle-Simpson aquifer.

4.3.1.3 State-Designated Aquifers

In addition to the EPA-designated SSA program, individual states may enact regulations protecting significant aquifer recharge areas where excessive use of groundwater poses a threat to the long-term integrity of a water-supply source, or preservation areas to protect natural resources including public water supply sources. The OWRB conducted an extensive study of the Arbuckle-Simpson aquifer following a moratorium on groundwater permits imposed by the Oklahoma State Legislature in 2003. The OWRB considers the entire Arbuckle-Simpson aquifer to be a "sensitive sole source groundwater basin" due to the EPA designation of the eastern portion as a SSA (Christenson et al., 2011).

4.3.1.4 Water Supply Wells and Springs

Public databases maintained by the ODEQ and OWRB were used to identify public and private water wells within 400 and 150 feet, respectively, of the project workspace. A total of 19 private wells were identified within 150 feet of the project workspace, including 17 along the Mainline and 2 along the Chisholm Lateral. Three wells were identified within the project workspace; however, field surveys confirmed that the wells do not exist at these locations. No private wells were identified within 150 feet of the Velma Lateral (see table 4.3.1-2). There are no public water supply wells within 400 feet of project workspace. Two springs were identified within 150 feet of the Mainline: one about 90 feet northeast of MP 199.3 and one about 80 feet south of MP 139.0.

4.3.1.5 Wellhead Protection Areas

The ODEQ is required to develop and implement a Wellhead Protection Program under the Safe Drinking Water Act, and was approved by the EPA to develop a Source Water Assessment Program following the Safe Drinking Water Act Amendments in 1986. The ODEQ is thereby responsible for identifying the land and recharge areas contributing to public supply wells and limiting activities that could cause pollution to prevent contamination of drinking water supplies.

While one municipal wellhead protection area was identified at Mainline MP 47.6 (OWRB, 2011), the ODEQ clarified that the well did not exist. Therefore, we conclude that the project would not affect wellhead protection areas.

TABLE 4.3.1-2

Water Wells near the MIDSHIP Project [a]

Facility/Milepost [b]	County	Supply Type	Approximate Distance from Workspace (feet)	Direction from Workspace
Mainline				
8.0	Canadian	Domestic	57.3	West
30.4	Grady	Domestic	132.7	East
46.7	Grady	Domestic	70.0	West
50.9	Grady	Irrigation	84.7	West
60.0	Grady	Domestic	91.8	Southwest
60.5	Grady	Domestic	39.9	Southwest
74.2	Grady	Large-capacity industrial	105.9	South
89.9	Garvin	Mining	134.1	East
89.9	Garvin	Domestic	134.1	East
92.8	Garvin	Domestic	42.5	Northeast
99.4	Garvin	Domestic	56.5	East
99.4	Garvin	Domestic	56.5	East
126.1	Carter	Agriculture (non-irrigation)	0.0	NA [c]
126.1	Carter	Agriculture (non-irrigation)	0.0	NA [c]
126.1	Carter	Agriculture (non-irrigation)	0.0	NA [c]
173.1	Bryan	Domestic	58.7	South
195.6	Bryan	Domestic	142.4	North
Chisolm Lateral				
0.7	Kingfisher	Domestic	84.2	South
16.3	Kingfisher	Agriculture (non-irrigation)	25.3	North

Sources: ODEQ, 2017

[a] Search buffers of 400 and 150 feet were used for public and private wells, respectively. No public wells were identified.

[b] No private or public wells were identified within 400 or 150 feet, respectively, of the project's aboveground facilities or the Velma Lateral.

[c] Well was identified using available GIS data; however, field surveys confirmed that the well does not exist at this location.

4.3.1.6 Contaminated Groundwater

As discussed in section 4.2.2.6, available databases from the ODEQ and EPA were searched to identify sites within 0.5 mile of project facilities with potential and/or known sources of contamination. One site was identified about 0.25 mile southwest of access road 70 and about 0.4 mile southwest of Mainline MP 102.0; however, the EPA determined that contamination was not present at the site (EPA, 2017b). Therefore, it is not anticipated that project construction would encounter areas of contaminated soil or groundwater. If unanticipated contaminated soil and/or groundwater is encountered during construction, Midship Pipeline would follow its Unanticipated Contamination Plan (see section 4.2.2.6).

4.3.1.7 Groundwater Impacts and Mitigation

Pipeline and aboveground facility construction activities such as trench dewatering, blasting, and spills or leaks of hazardous materials have the potential to affect groundwater in several different ways. Clearing, grading, trenching, and soil stockpiling activities within the proposed right-of-way may cause minor fluctuations in local groundwater levels and/or increased turbidity due to erosion and sediment runoff, especially where shallow aquifers exist. Soil compaction caused by heavy equipment could reduce water infiltration rates. Construction of aboveground facilities may result in minor, permanent increases of impervious areas; however, the facilities are unlikely to affect infiltration or groundwater recharge beyond the facility limits.

In areas where groundwater is near the surface, trench excavation may intersect the shallow water table and dewatering may be required. Dewatering of trenches may result in temporary fluctuations in local groundwater levels; however, trench water would be discharged into well-vegetated upland areas to allow infiltration and minimize impacts on the local water table. After installation of the pipeline and aboveground facilities, the ground surface would be restored as close as practicable to original contours, and any exposed soils would be revegetated to ensure restoration of preconstruction overland flow and recharge patterns. Therefore, these minor, direct, and indirect impacts would be temporary and would not significantly affect groundwater resources.

Midship Pipeline did not identify any known karst features within the project workspaces; however, the potential exists that certain bedrock units within the proposed right-of-way may exhibit karst-like features (see section 4.1.4.6). If karst is encountered during construction, Midship Pipeline would implement its *Karst Mitigation Plan* (see section 4.1.4.6). Midship Pipeline would implement the best management practices described in the plan as necessary to mitigate the risks to groundwater quality, such as increased sedimentation into sinkholes or changes in recharge characteristics, and impacts on pipeline integrity associated with construction in karst terrain.

Blasting

Midship Pipeline identified several areas along the proposed project right-of-way where blasting may be required (see section 4.1.2). Blasting could temporarily affect well and/or spring yields where water wells or springs are close to the blasting area, and/or increase groundwater turbidity near the construction right-of-way. However, it is anticipated that rock particles and sediment would settle out of suspension relatively quickly. Midship Pipeline would use non-blasting techniques where practicable. For areas that require blasting, Midship Pipeline would implement its *Blasting Plan* (see section 4.1.6) to minimize impacts on groundwater. Per the *Blasting Plan*, Midship Pipeline would obtain all required federal, state, and local permits and would employ licensed blasting contractors to conduct blasting activities in accordance with applicable regulations.

Impacts on nearby wells and springs from blasting would be temporary. Midship Pipeline has agreed to perform pre- and post-construction monitoring for private wells and springs within 150 feet of the project workspace, subject to landowner approval. Midship Pipeline would test private wells and springs for total suspended solids, well yield, and compounds associated with the incomplete detonation of explosives such as nitrate and nitrite. We received comments on the draft EIS from the U.S. Department of the Interior's (DOI) Office of Environmental Policy and Compliance regarding groundwater quality sampling parameters. In response, we are recommending that Midship Pipeline submit a spring and well

water quality sampling plan that incorporates these recommendations where appropriate (see Water Use and Quality).

In the event that a construction-related activity impacts the yield or water quality of a well or spring, Midship Pipeline would work with the landowner and repair or restore the well or spring and provide an alternate water source until repairs are made, or provide compensation to the owner for damages. Therefore, we conclude that these actions would minimize and mitigate the potential impacts of blasting on groundwater wells and springs.

Water Use and Quality

We received scoping comments related to concerns about impacts on water wells and springs within or near the project workspaces. At this time, no wells or springs are identified within the project workspace; however, if a previously unidentified well is encountered during construction, Midship Pipeline would install fences around any wells within construction workspaces to prevent damage from construction equipment and would work with the landowner to permanently mark or fence off these wells to prevent damage from operational maintenance activities (e.g., mowing). Midship Pipeline has committed to conducting pre- and post-construction well yield and water quality sampling on all 19 water wells and 2 springs within 150 feet of the project workspace, with the well owner's permission, and repair and replace wells and springs as necessary to serve the preconstruction purpose of the well or spring. Midship Pipeline has also confirmed it would not store hazardous materials, refuel equipment or vehicles, or park equipment or vehicles overnight within 100 feet of wetlands, waterbodies, wells, and/or springs.

On March 22, 2018, the DOI's Office of Environmental Policy and Compliance provided comments on the draft EIS regarding water quality sampling parameters and the development of a spring and well water quality sampling plan. The sampling parameters outlined by the DOI are derived from ODEQ guidance to all private well owners, as well as EPA drinking water standards. For example, the DOI recommends testing for total dissolved solids, total petroleum hydrocarbons, and specific conductance because these contaminants have been related to oil and gas development and extraction throughout the project area. In addition, geogenic (i.e., naturally occurring) arsenic in soils of Oklahoma has been shown to exceed the EPA's carcinogenic screening levels. Finally, Midship Pipeline has committed to testing for nitrate and nitrite to screen for compounds associated with the incomplete detonation of explosives; however, nitrate and nitrite are common contaminants and may not definitely correlate to blasting. Instead, the DOI is recommending testing for explosive residual compounds using the EPA method(s) 8330(a) (Nitroaromatics and Nitramines by High Performance Liquid Chromatography). Because soils in the project area contain these contaminants, and project construction could cause these contaminants to leach into drinking water and affect residents, we agree that Midship Pipeline should provide a spring and well water quality sampling plan; therefore, **we recommend that:**

- **Prior to construction, Midship Pipeline should file with the Secretary, for review and written approval by the Director of OEP, a spring and well water quality sampling plan. The plan should incorporate the following sampling parameters, or provide sufficient explanation as to why a specific parameter would not provide information relevant to restoring wells and springs affected by construction of the project:**

  a. total dissolved solids;
  b. total suspended solids;
  c. pH;
  d. specific conductance;
  e. arsenic;
  f. metals (including beryllium, cadmium, chromium, iron, lead, and vanadium);

g. major ions (including calcium, chloride, potassium, sodium, and sulfate);
h. nitrate and nitrite;
i. total petroleum hydrocarbons;
j. explosive residue compounds (EPA method[s] 8330[a]); and
k. fecal coliform (if the well head is opened for sampling purposes).

In addition to potential impacts on water wells and springs, a 1999 OWRB state-wide study determined that unconfined, shallow alluvial aquifers with higher porosity and permeability are likely to be more vulnerable than bedrock aquifers to contamination caused by inadvertent spills of hazardous materials used during construction. Specifically, the North Canadian, Canadian, and Washita River alluvial aquifers described in section 4.3.1.1 were classified as having very high vulnerability, while the Arbuckle-Simpson and Antlers bedrock aquifers were classified as having high and moderate vulnerabilities, respectively (Osborn and Hardy, 1999).

We received scoping comments related to potential impacts of leaks and spills on these vulnerable aquifers. Implementation of the measures in Midship Pipeline's SPRP would minimize the potential for groundwater impacts associated with an inadvertent spill of hazardous materials. The SPRP identifies preventative measures to minimize the likelihood of a spill, including secondary containment for aboveground tanks, drums, or storage containers, routine inspections of equipment and regular equipment maintenance, and environmental compliance training for all contractors and employees. In addition, Midship Pipeline would not store hazardous materials, refuel equipment or vehicles, or park equipment or vehicles overnight within 100 feet of a wetland, waterbody, spring, or water well unless the EI cannot identify a reasonable alternate location. Finally, the SPRP includes spill response measures that include maintaining spill response equipment at each spread and at hazardous material storage locations, emergency notification procedures, and spill containment measures to recover spilled materials and facilitate cleanup operations. We have reviewed the SPRP and find it acceptable.

4.3.1.8 Conclusion

The project would not significantly affect groundwater resources because the majority of construction would involve shallow, temporary, and localized excavation. These potential impacts would be avoided or further minimized by the use of the construction techniques and mitigation described in the Plan and Procedures and Midship Pipeline's *Karst Mitigation Plan* and *Blasting Plan*. In addition, Midship Pipeline would prevent or adequately minimize inadvertent spills and leaks of hazardous materials into groundwater resources during construction and operation by adhering to its SPRP. Therefore, we conclude that potential impacts on groundwater resources would be avoided, minimized, or mitigated.

4.3.2 Surface Water

4.3.2.1 Existing Surface Water Resources

Surface waters include waterbodies such as natural or artificial streams, rivers, or drainages with perceptible flow, and other permanent waterbodies such as ponds and lakes. Midship Pipeline identified waterbodies throughout the majority of the project area during field surveys conducted from 2016 through 2018. As of May 2018, about 98 percent of the proposed route was field surveyed for surface waters. Completion of field surveys is primarily dependent upon acquisition of survey permission from landowners. For areas where surveys could not be completed, Midship Pipeline delineated waterbodies using desktop sources including aerial imagery, USGS topographic maps, and other GIS-based information.

The pipeline facilities would cross seven watersheds or drainage basins across Oklahoma. The name, eight-digit hydrologic unit code, drainage area, and the approximate location of each watershed along the routes are provided in table 4.3.2-1.

TABLE 4.3.2-1

Watersheds Crossed by Pipeline Facilities Associated with the MIDSHIP Project

Facility/Watershed	8-Digit Hydrologic Unit Code	Approximate Milepost Range	Drainage Area (square miles)
Mainline			
Lower Cimmarron-Skeleton	11050002	0.0 to 4.9	3,235
Middle North Canadian	11100301	4.9 to 17.9	1,858
Lower Canadian-Walnut	11080202	17.9 to 37.3	1,833
Upper Washita	11130302	37.3 to 55.7	3,209
Middle Washita	11130303	55.7 to 138.8	2,508
Lower Washita	11130304	138.8 to 166.5	731
Blue	11140102	166.5 to 199.6	687
Chisholm Lateral			
Lower Cimmarron-Skeleton	11050002	CH0.0 to CH20.5	3,235
Velma Lateral			
Middle Washita	11130303	VE0.0 to VE13.8	2,508
Tie-in Piping			
Middle North Canadian	11100301	0.0 to 0.2	1,858

A total of 407 waterbodies are within the proposed construction workspace. Of these, 344 waterbodies would be crossed during pipeline installation (327 using open-cut crossing methods and 17 using the HDD method), and 10 would be crossed by access roads.[3] The remaining 53 waterbodies would be within the project workspace but not crossed by the pipeline centerline or access roads. Some waterbodies are crossed more than once. Appendix J includes the unique identification number, waterbody name, milepost, flow regime, crossing width, fishery type, state water classification, and proposed crossing method for every waterbody within the project workspace. As summarized in table 4.3.2-2, the proposed crossings include 58 perennial waterbodies, 121 intermittent waterbodies, 213 ephemeral waterbodies, and 15 ponds.[4] The project would involve five major waterbody crossings[5] including the Canadian River at Mainline MP 28.4, the Washita River at Mainline MP 65.0, the Washita River at Mainline MP 135.9, an unnamed pond at Mainline MP 149.3, and an unnamed tributary to Caddo Creek at Mainline MP 181.1. With the exception of one waterbody within the ATWS associated with the Velma Meter Station, no waterbodies would be affected at the proposed aboveground facility sites, along proposed access roads for the aboveground facilities, or within the proposed contractor yards.

[3] Five waterbodies would be crossed by both access roads and the pipeline centerline. These waterbodies are included in the pipeline waterbody counts.

[4] This would equate to a total of 3,140.8 linear feet of streams crossed during pipeline installation, including about 902.7 feet for perennial streams, 1,033.2 feet for intermittent streams, 816.9 feet for ephemeral streams, and 388.0 feet of for ponds. The linear width of waterbodies crossed by the HDD method is not included. Three ponds would be adjacent to ATWS but not within the project workspace. These ponds are not included in these waterbody totals.

[5] A "major" waterbody is greater than 100 feet wide at the water's edge at the time of crossing.

TABLE 4.3.2-2

Summary of Waterbodies Crossed by the MIDSHIP Project[a]

Facility	Flow Regime				Total Waterbodies	
	Ephemeral (no.)	Intermittent (no.)	Perennial (no.)	Ponds (no.)	No.	Linear Feet
Mainline	187	106	43	10[b]	346	2,669.5
Chisholm Lateral	13	5	6	1	25	167.8
Velma Lateral [c]	7	8	9	2	26	303.7
Access Roads [d]	6	2	0	2	10	0.0 [e]
Total	213	121	58	15	407	3,140.8

[a] Includes the total number of waterbodies crossed by project workspace. Some waterbodies are crossed multiple times (see Appendix J).

[b] Three ponds listed in appendix J would be adjacent to ATWS but not within the project workspace. These ponds are not included in these waterbody totals.

[c] One intermittent waterbody is within the proposed ATWS associated with the Velma Meter Station and would also be crossed by the Velma Lateral. This waterbody is only counted once.

[d] Three intermittent waterbodies and two perennial waterbodies would be crossed by both access roads and the pipeline centerline. These waterbodies are included in the pipeline waterbody counts.

[e] Midship Pipeline would use existing bridges and access roads to cross waterbodies.

In response to our recommendation in the draft EIS, Midship Pipeline filed updated surface water and wetland field survey results for the project. In addition, as required by recommendation no. 6 in section 5.2 and in accordance with the requirements of the Procedures, Midship Pipeline would be required to complete all required surveys and reports for each discrete project facility and file a revised wetland delineation report prior to construction, if applicable.

4.3.2.2 Source Water Protection Areas and/or Public Watersheds

Midship Pipeline identified a public water supply intake for the City of Tishomingo about 2.2 miles downstream of the Pennington Creek crossing at Mainline MP 154.1. Midship Pipeline met with the City of Tishomingo on August 8, 2017 to present a technical overview of the Pennington Creek crossing and answer questions. The City of Tishomingo provided information to Midship Pipeline about the water intake, and stated that the information provided by Midship Pipeline appeared to consider best environmental practices to protect the water intake. Midship Pipeline will continue to coordinate with the City of Tishomingo regarding mitigation of potential impacts on the public water supply. Because Midship Pipeline would use the HDD method to install the Mainline beneath Pennington Creek, would comply with the Procedures, and the water intake is 2.2 miles downstream from the crossing location, we conclude no direct impacts on the public water intake would occur. No other public water supply intakes occur within 3 miles downstream of a proposed waterbody crossing.

4.3.2.3 Water Classifications

Section 303(d) of the CWA requires each state to review, establish, and revise water quality standards for all surface waters within the state. In order to ensure water quality standards meet their designation, each state develops a classification system and monitoring and mitigation programs. Waters that fail to meet their designated use are considered impaired and are listed under a state's 303(d) list of impaired waters (ODEQ, 2015).

The OWRB has authority and responsibility to establish water quality standards under Title 82 Oklahoma Statutes section 82-1085.30. The water quality standards consist of three main components,

including the designation of beneficial uses, criteria to protect the designated uses, and antidegradation policies (OWRB, 2017a). The beneficial use water quality classifications currently recognized in Oklahoma include the following:

- public and private water supply – waters that can be used as sources of public and private raw water supplies;
- emergency public and private water supplies – waters that may be put to use during emergencies;
- fish and wildlife propagation – encompasses several subcategories that are capable of sustaining different climax communities of fish and shellfish:
  - habitat limited aquatic community – water chemistry and habitat are not adequate to support a "warm water aquatic community;"
  - warm water aquatic community – water quality and habitat are adequate to support climax fish communities;
  - cool water aquatic community – water quality, water temperature, and habitat are adequate to support cool water climax fish communities and includes an environment suitable for the full range of cool water benthos; and
  - trout fishery (seasonal) – water quality, water temperature, and habitat are adequate to support a seasonal put and take trout fishery;
- agriculture – waters maintained so that toxicity does not inhibit continued ingestion by livestock or irrigation of crops;
- primary body contact recreation – waters maintained so that no chemical, physical or biological substances are in concentrations that are irritating to skin or sense organs or are toxic or cause illness upon ingestion by human beings;
- secondary body contact recreation – waters with less stringent body contact designation where ingestion of water is not anticipated, such as during boating, fishing, or wading;
- navigation – waters maintained to generally be dependent upon quantity of water rather than quality of water; and
- aesthetics – waters maintained to be aesthetically enjoyable.

There are also waterbodies classified under special provisions to include limitations for additional protection:

- Outstanding Resource Waters – waters of the state that constitute outstanding resources or are of exceptional recreational and/or ecological significance;
- Appendix B Waters – waters of the state that are within the boundaries of areas including but not limited to the national and state parks, forests, wilderness areas, wildlife management areas, and wildlife refuges, and may include those areas that are inhabited by federally listed, threatened, or endangered species, and other appropriate areas;

- High Quality Waters – waters of the state with historic water quality and physical habitat that provide conditions suitable for the support of sensitive and intolerant climax communities of aquatic organisms whether or not that waterbody currently contains such a community, and support high levels of recreational opportunity;
- Sensitive Public and Private Water Supplies – waters of the state that constitute sensitive public and private water supplies as a result of their unique physical conditions;
- Culturally Significant Waters – waters of the state identified by recognized tribal authorities as critical to maintaining the waters' utility for cultural, historic, recreational or ceremonial uses and which may require more stringent protection measures to protect human health or aquatic life or both; and
- Sensitive Public and Private Waters Supplies with Reuse – waters of the state that constitute sensitive public and private water supplies that may be augmented with reclaimed municipal water for the purpose of indirect potable reuse.

4.3.2.4 Sensitive Waterbodies

Waterbodies that may be considered sensitive to pipeline construction include, but are not limited to:

- waters that do not meet the water quality standards associated with the state's designated beneficial uses;
- waterbodies that support species of special concern;
- waterbodies that are crossed less than 3.0 miles upstream of potable water intake structures;
- outstanding or exceptional quality waterbodies;
- surface waters that have important riparian areas; and
- rivers on or designated to be added to the Nationwide Rivers Inventory or a state river inventory.

Other factors that can provide a basis for sensitivity include surface waters that have been designated for intensified water quality management and improvement, waters of particular ecological and recreational importance, waterbodies located in sensitive or protected watersheds, and waterbodies and intermittent drainages that have steep banks and other characteristics that might contribute to high risk of erosion impacts. As discussed in section 4.3.2.2, Midship Pipeline identified one public water supply intake about 2.2 miles downstream of the Pennington Creek crossing at Mainline MP 154.1. Other waterbodies affected by the project that may be considered sensitive based on the above criteria are discussed below.

Impaired Surface Waters

Table 4.3.2-3 lists the impaired waterbodies that would be crossed by the project, including milepost locations, impaired designated uses, pollutants, and the proposed crossing method for each. A total of 21 waterbodies crossed are listed as impaired for their designated use. Of these, 17 impaired waterbodies are crossed by the proposed Mainline, 1 is crossed by the Chisholm Lateral, and 3 are crossed by the Velma Lateral.

TABLE 4.3.2-3

Impaired Surface Waters Crossed by Pipeline Facilities for the MIDSHIP Project

Facility/Waterbody I.D.	Waterbody Name	Milepost	Impaired Designated Use(s)	Pollutant(s)	Crossing Method
Mainline					
S-CN-WCR-16/12/08-01	North Canadian River	7.7	Primary Body Contact Recreation	Enterococcus bacteria, Escherichia coli	HDD
S-GR-RKT-16/12/09-03	Canadian River	28.4	Primary Body Contact Recreation, Fish Consumption, Warm Water Aquatic Community	Enterococcus bacteria, Lead, Turbidity	HDD
S-GR-RFT-16/12/10-01	Buggy Creek	34.8	Agriculture, Primary Body Contact Recreation, Warm Water Aquatic Community	Sulfates, Total dissolved solids, Enterococcus bacteria, Escherichia coli, Macroinvertebrate bio	Flume or dam-and-pump
S-GR-RKT-16/12/12-02	Winter Creek	59.7	Warm Water Aquatic Community	Fishes bioassessments	Flume or dam-and-pump.
S-GR-RKT-16/12/13-19	Washita River	65.0	Primary Body Contact Recreation, Fish Consumption, Warm Water Aquatic Community	Enterococcus bacteria, Lead, Turbidity	HDD
S-GR-EHK-17/01/19-07	Roaring Creek	66.9	Primary Body Contact Recreation	Enterococcus bacteria, Escherichia coli	Flume or dam-and-pump
S-GA-RFT-16/12/16-10	Rush Creek	83.9	Warm Water Aquatic Community	Fishes bioassessments	Flume or dam-and-pump
S-GA-AJF-17/01/05-15	N. Pernell Creek, North (Unnamed Tributary to Salt Creek)	95.3	Agriculture	Chloride	Flume or dam-and-pump
S-GA-AJF-17/01/05-13	Pernell Creek (Unnamed Tributary to Salt Creek)	95.5	Agriculture	Chloride	Flume or dam-and-pump
S-CR-AJF-17/01/10-18	Wildhorse Creek	100.5	Agriculture, Primary Body Contact Recreation, Warm Water Aquatic Community	Chloride, Enterococcus bacteria, Fishes bioassessments	HDD
S-CR-LAG-17/01/10-01	Washita River	135.9	Primary Body Contact Recreation, Fish Consumption, Warm Water Aquatic Community	Enterococcus bacteria, Lead, Turbidity	HDD
S-JO-RKT-17/01/21-01	Oil Creek	141.4	Primary Body Contact Recreation	Enterococcus bacteria	Flume or dam-and-pump
S-JO-EHK-17/02/02-06	Mill Creek	146.0	Primary Body Contact Recreation	Enterococcus bacteria	Flume or dam-and-pump

TABLE 4.3.2-3 (cont'd)

Impaired Surface Waters Crossed by Pipeline Facilities for the MIDSHIP Project

Facility/Waterbody I.D.	Waterbody Name	Milepost	Impaired Designated Use(s)	Pollutant(s)	Crossing Method
S-JO-AAL-17/01/24-02	Big Sandy Creek	157.7	Primary Body Contact Recreation	Enterococcus bacteria	Flume or dam-and-pump
S-BR-TAS-17/01/13-02	Caddo Creek	182.0	Primary Body Contact Recreation, Warm Water Aquatic Community	Enterococcus bacteria, Dissolved oxygen	Open cut
S-BR-AJF-17/01/12-02	Bokchito Creek	191.5	Primary Body Contact Recreation	Enterococcus bacteria	Flume or dam-and-pump
AS-BR-NHD-Line-195	Sulphur Creek	195.7	Primary Body Contact Recreation, Warm Water Aquatic Community	Enterococcus bacteria, Escherichia coli, Dissolved oxygen	Flume or dam-and-pump
Chisholm Lateral					
S-KI-TAS-17/01/17-01	Uncle Johns Creek	CH9.5	Primary Body Contact Recreation	Enterococcus bacteria, Escherichia coli	Flume or dam-and-pump
Velma Lateral					
S-ST-WCR-17/04/11-02	Velma Creek (Tributary to Wildhorse Creek)	VE1.0	Agriculture	Chloride	Flume or dam-and-pump
S-ST-RFT-17/04/10-10	Wildhorse Creek Trib. A (Tributary to Wildhorse Creek)	VE7.1	Agriculture	Chloride	Flume or dam-and-pump
S-CR-RFT-17/04/11-03	Sandy Bear Creek, West Fork (Tributary to Wildhorse Creek)	VE9.4	Agriculture	Chloride	Flume or dam-and-pump

Source: ODEQ, 2015
Notes: HDD = Horizontal directional drill method

Waterbodies that Support Fisheries of Special Concern

Midship Pipeline coordinated with the U.S. Fish and Wildlife Service (FWS) and the Oklahoma Natural Heritage Inventory (ONHI) to identify proposed project waterbody crossings that may contain federally or state-listed species and designated critical habitat. One waterbody crossed by the proposed Mainline, the Canadian River (MP 28.4), supports the Arkansas River shiner (*Notropis girardi*), which is federally listed as a threatened species. In addition, the Canadian River and the 300-foot-wide riparian buffer on either side of the river are designated critical habitat for the Arkansas River shiner. Additional information regarding the Arkansas River shiner and other special status species is provided in section 4.7.

Midship Pipeline also identified one waterbody that supports fisheries of special concern. The least darter (*Etheostoma microperca*) is known to occur within the Blue River, which is crossed by the Mainline at MP 174.0. Additional information regarding the least darter is provided in section 4.6.2.1.

Based on data from the OWRB, the proposed Mainline also crosses sensitive fisheries at Pennington Creek (MP 154.1), which is a designated cool water aquatic community (OWRB, 2017b). Additional information regarding potential impacts on fisheries is provided in section 4.6.2.

Exceptional Quality Waters

No waterbodies listed under the Oklahoma Scenic Rivers Act would be crossed by the proposed pipeline routes (Title 82 Oklahoma Statutes, Section 1452[b]). One waterbody crossed by the proposed Mainline, Pennington Creek, has been designated as a High Quality Water (OWRB, 2017b). This designation indicates that water quality exceeds the levels necessary to support the propagation of fishes, shellfishes, wildlife, and recreation in and on the water. Additional information regarding potential impacts on fisheries within Pennington Creek is provided in section 4.6.2. Further, the designation prohibits any new point source discharges or additional load or increased concentration of specified pollutants (OWRB, 2017b).

Wild and Scenic Rivers and Nationwide Rivers Inventory

Section 5(d) of the National Wild and Scenic Rivers Act requires federal agencies to consider potential national wild, scenic, and recreational river areas in planning for the use and development of water and related land resources. In addition to those rivers designated as part of the National Wild and Scenic Rivers System, the National Park Service (NPS) has compiled and maintains a Nationwide Rivers Inventory (NRI), a register of river segments that potentially qualify as national wild, scenic, or recreational river areas. Because these river segments have been determined to be of more than local or regional significance, federal agencies must seek to avoid or mitigate actions that would adversely affect NRI segments (NPS, 2017a).

No federally designated wild and scenic rivers would be crossed by the proposed pipeline routes. However, the proposed Mainline would cross the Blue River at MP 174.0, which is included on the NRI (NPS, 2017b). This segment of the Blue River is included on the NRI due to its location along the migration route of the federally endangered whooping crane, because it is a potential component of the State Scenic Rivers System,[6] and it is characterized as the most scenic stream in this section of the state (NPS, 2017b). Additional information on the whooping crane is provided in section 4.7.1.5. Additional information on this segment of the Blue River as it relates to recreational use is provided in section 4.8.5.2.

4.3.2.5 Waterbody Construction Procedures

Midship Pipeline proposes to install the pipeline beneath most waterbodies using the wet open-cut and HDD methods. Dry crossing methods (flume pipe or dam-and-pump) would be used at perennial waterbodies that are intermediate in width and at all but one waterbody designated as impaired (see table 4.3.2-3). Dry crossing methods may also be used at additional crossings if field conditions allow at the time of construction. Each of these crossing methods is briefly described below and discussed in more detail in section 2.3.2. Midship Pipeline would construct waterbody crossings in accordance with federal, state, and local permits and the Procedures. This includes avoidance and minimization of impacts in accordance with the CWA Section 404(b)(1) Guidelines (40 CFR 230).

Wet Open-Cut Crossing Method

Midship Pipeline proposes to use the wet open-cut method at 301 waterbody crossings. At each crossing, backhoe-type excavators would operate from the banks to open a trench across the waterbody channel. Water flow would be maintained during excavation, and trench spoil for use as backfill would be placed on the banks above the known high water line. A prefabricated section of pipe, weight coated as

[6] The Blue River is not currently designated as a scenic river area by the state of Oklahoma (Title 82 Oklahoma Statutes, Section 1452(b)).

necessary to provide negative buoyancy, would be lowered into the trench, and the backfill placed over the pipe. In accordance with the Procedures, Midship Pipeline would be required to complete minor (less than 10 feet in width) and intermediate (greater than 10 feet but less than 100 feet in width) waterbody crossings within 24 and 48 hours, respectively. Following the completion of in-stream activities, waterbody banks would be stabilized and temporary sediment barriers would be installed within 24 hours. A minimum of 5 feet of cover would be placed over the pipeline (18 inches for rock excavations).

Dry Crossing Methods

Midship Pipeline proposes to use the dry crossing method at 43 waterbody crossings. There are two dry crossing methods that may be used to cross waterbodies, if conditions allow: the flume crossing method and the dam-and-pump crossing method. The flume crossing method consists of temporarily directing the flow of water through one or more flume pipes placed over the area to be excavated and trenching beneath the flume pipes in relatively dry conditions. The dam-and-pump crossing method involves installing a dam (typically made with sandbags and plastic sheeting) upstream of the crossing and pumping water from the upstream side to the downstream side of the crossing to allow the crossing to be constructed in relatively dry conditions.

Horizontal Directional Drill

Midship Pipeline proposes to use the HDD method to cross waterbodies in 12 locations, spanning a total of 17 waterbodies.[7] The process would commence with the boring of a pilot hole along a predetermined path beneath the waterbody, followed by enlargement of the hole with one or more passes of a reamer until the hole is the necessary diameter to facilitate the pull-back (installation) of the pipeline. Once the reaming passes are completed, a prefabricated pipe segment would be pulled through the hole to complete the crossing. Throughout the process of drilling and enlarging the hole, a slurry made of non-toxic/non-hazardous bentonite clay and water, referred to as drilling mud, would be circulated through the drilling tools to lubricate the drill bit, remove drill cuttings, and hold the hole open.

Blasting at Waterbodies

About 14.1 miles of the proposed Mainline would cross an area with hard, lithic bedrock that could require blasting. Based on a review of SSURGO data, there are three streams with shallow bedrock that may require blasting or other special construction techniques during construction (see table 4.3.2-4). As such, blasting in waterbodies would be minimal. No blasting is anticipated along the Chisholm or Velma Laterals.

TABLE 4.3.2-4

Waterbody Crossings That May Require Blasting During Construction of the MIDSHIP Project

Facility/Stream Name	Waterbody ID	Milepost	Crossing Width (feet)	Soil Type	Depth to Bedrock (inches)
Mainline					
Sand Creek	S-JO-AAL-17/01/10-08	150.3	11	Chigley-Rock outcrop complex, 1 to 8 percent slopes	0
Tributary to Sand Creek	S-JO-AAL-17/01/10-09	150.3	8	Chigley-Rock outcrop complex, 1 to 8 percent slopes	0
Tributary to Pennington Creek	S-JO-TAS-17/01/11-10	155.1	9	Chigley-Rock outcrop complex, 1 to 8 percent slopes	0

[7] Midship Pipeline would cross 17 waterbodies at 12 HDD crossing locations. The Rock Creek, Blue River, and State Highway 76 HDDs would cross more than one waterbody at each location (see appendix J).

Access Roads

Fifteen waterbodies would be crossed by temporary access roads during construction of the project (see appendix J). Although each is an existing road, modifications could include widening, grading, installation of culverts, and/or addition of gravel. The access road improvements would not require in-stream construction. Midship Pipeline would conduct all access road improvements and waterbody crossings in accordance with applicable federal, state, and local permits and regulations.

Water for Hydrostatic Testing, Horizontal Directional Drill Operations, and Dust Control

Hydrostatic Testing

Before placing the pipeline in service, Midship Pipeline would verify the structural integrity of the pipeline and aboveground facilities by conducting hydrostatic testing. This testing would be conducted in accordance with DOT regulations to ensure the system is capable of withstanding the appropriate test pressure for 8 hours (49 CFR 192). This testing involves filling the pipeline with water, pressurizing it, and then checking for pressure losses due to pipeline leakage. The integrity of the piping at aboveground facilities would also be hydrostatically tested. Midship Pipeline estimates a need for about 59 million gallons of water to conduct the hydrostatic testing of pipeline segments and aboveground facilities (see table 4.3.2-5). Of this total, about 58.4 million gallons would be for testing pipeline segments and about 600,000 gallons would be for testing piping within the proposed aboveground facilities.

Test water would be acquired from either municipal or surface water sources. In accordance with our Procedures, surface water would be drawn through a screened intake to prevent entrainment of fish and other aquatic organisms. Also in accordance with the Procedures, Midship Pipeline would maintain sufficient flow rates in the waterbody at each withdrawal location to protect aquatic life and support existing downstream water uses and water withdrawals. Midship Pipeline is aware, however, that some surface water sources intended for use may not be available at the time tests are supposed to take place because of dry conditions or other reasons. In the event that a required volume of surface water is unavailable at the time of a scheduled hydrostatic test, Midship Pipeline would use municipal water.

Upon completion of the hydrostatic test, the water would either be pumped to the next segment for testing or discharged at a rate of 1,500 gallons per minute through an energy-dissipating device in compliance with National Pollutant Discharge Elimination System (NPDES) permit conditions. Water would be discharged to an upland site and not directly into a waterbody. Test water would contact only new pipe, and Midship Pipeline would not add chemicals. In the event that municipal water is used, the water would be dechlorinated prior to discharge. Once a segment of pipe has been successfully tested and dried, the test cap and manifold would be removed, and the pipe would be connected to the remainder of the pipeline. Drying pigs would be used to dry the pipeline; no desiccant or chemical additives would be used. Midship Pipeline submitted its Hydrostatic Test Discharge Application to the EPA on April 6, 2018. Midship Pipeline has committed to conducting discharges in accordance with EPA and OCC permit requirements.

Horizontal Directional Drill Operations

Midship Pipeline would use the HDD method at 13 locations, 11 along the Mainline and 2 along the Velma Lateral. Throughout the process of drilling and enlarging the hole, a slurry made of non-toxic/non-hazardous bentonite clay and water, referred to as drilling mud, would be circulated through the drilling tools to lubricate the drill bit, remove drill cuttings, and hold the hole open. Midship Pipeline estimates that a total of up to 1.56 million gallons of water would be required to create the drilling mud for the HDD installations. Table 4.3.2-6 details the surface water requirements for drilling mud at each HDD location.

TABLE 4.3.2-5

Hydrostatic Test Water Requirements for the MIDSHIP Project

Facility/Milepost Range	Withdrawal Source	Withdrawal Location (milepost)	Discharge Location (milepost)	Discharge Rate (gpm)	Estimated Volume (gallons)
Pipeline Segment					
0 to 11.1	North Canadian River	7.7	7.5	1,500	3,016,196
11.1 to 34.8	Buggy Creek	34.8	34.8	1,500	6,339,208
34.8 to 55.6	Buggy Creek (alternate – ranch pond west of proposed pipeline)	34.8	34.8	1,500	5,595,772
55.6 to 86.7	Winter Creek Site 9 Reservoir	60.5	60.5	1,500	8,303,747
86.7 to 92.1	Wildhorse Creek Site 90 Reservoir	88.8	88.8	1,500	1,518,297
92.1 to 99.5	Wildhorse Creek Site 86 Reservoir	92.4	92.4	1,500	1,994,409
99.5 to 119.2	Caddo Creek Site 7 Reservoir	110.9	110.9	1,500	5,291,611
119.2 to 131.1	Unnamed pond north of proposed pipeline	126.2	126.1	1,500	3,227,690
131.1 to 137.6	Cascade water from Washita River and Mill Creek	135.9	135.7 [a]	1,500	1,788,829
137.6 to 141.3	Cascade water from Washita River and Mill Creek	135.9[a]	141.3 [b]	1,500	1,074,009
141.3 to 144.8	Cascade water from Washita River and Mill Creek	135.9 [b]	144.8 [c]	1,500	995,676
144.8 to 146.0	Cascade water from Washita River and Mill Creek	135.9[c]	146.0	1,500	378,034
146.0 to 173.0	Ranch pond east of proposed pipeline	159.5	159.4	1,500	7,229,538
173.0 to 199.7	Martin Lake	174.5	174.5	1,500	7,141,131
CH0.0 to CH20.4	Uncle John Creek Site 13 Reservoir	CH7.1	CH7.1	1,500	3,792,645
VE0.0 to VE13.9	Wildhorse Creek	VE9.7	VE9.7	1,500	731,537
Subtotal					**58,418,328**
Aboveground Facilities					
Calumet Compressor Station	Unnamed Pond	18.8	N/A [d]	1,000	150,000
Tatums Compressor Station	Wildhorse Creek	100.5	N/A [d]	1,000	150,000
Bennington Compressor Station and NGPL Meter Station	Unnamed Pond	199.2	N/A [d]	1,000	150,000
Sholem Booster Station	Municipal	N/A	N/A [d]	1,000	50,000
Okarche/Mark West Meter Station	Municipal	N/A	N/A [d]	1,000	3,740
Canadian Valley Meter Station	Municipal	N/A	N/A [d]	1,000	3,740
Cana Meter Station	Municipal	N/A	N/A [d]	1,000	3,740
Iron Horse Meter Station	Municipal	N/A	N/A [d]	1,000	3,750
Grady Meter Station	Municipal	N/A	N/A [d]	1,000	3,750
NGPL 801 Meter Station	Unnamed pond	199.2	N/A [d]	1,000	3,750
Bennington Meter Station	Municipal	N/A	N/A [d]	1,000	21,000
Chisholm Meter Station	Municipal	N/A	N/A [d]	1,000	5,500
Velma Meter Station	Municipal	N/A	N/A [d]	1,000	3,740
				Subtotal	**560,220**
TOTAL					**58,978,549**

[a] A portion of the water appropriated from the Washita River for this test (1,074,009 gallons) would be pumped to the next segment for hydrostatic testing. The remaining 714,820 gallons of water would be discharged to an upland site.

[b] A portion of the water for this test (995,676 gallons) would be pumped to the next segment for hydrostatic testing. The remaining 78,333 gallons of water would be discharged to an upland site.

[c] A portion of the water for this test (378,034 gallons) would be pumped to the next segment for hydrostatic testing. The remaining 617,642 gallons of water would be discharged to an upland site.

[d] Water used for hydrostatic testing at aboveground facilities would be discharged at an upland location on site.

TABLE 4.3.2-6

Horizontal Directional Drill Water Requirements for the MIDSHIP Project (in gallons)

HDD Segment	Withdrawal Source	Withdrawal Location (milepost)	Hydrostatic Test Water Discharge Location (milepost) [a]	Estimated Drilling Mud Water Volume	Estimated Pre-pullback Hydrostatic Test Water Volume	Total Estimated HDD Water Volume
North Canadian River	North Canadian River	7.7	7.5	98,400	69,677	168,077
Interstate 40 (Historic Route 66)/Tributary to the North Canadian River	Unnamed pond	15.8	15.8	109,333	76,339	185,672
Canadian River	Municipal	N/A	28.0	224,132	160,393	384,525
OKT Railroad	Municipal	N/A	36.7	101,133	69,828	170,961
Washita River Crossing 1	Washita River	65.0	64.8	120,266	82,901	203,167
Wildhorse Creek	Wildhorse Creek	100.5	100.6	103,866	71,030	174,896
Henry House Creek	Henry House Creek	120.2	120.1	103,866	75,137	179,003
Washita River Crossing 2	Washita River	135.9	135.7	147,599	103,389	250,988
Rock Creek	Rock Creek	151.7	152.1	240,532	169,910	410,442
Pennington Creek	Municipal	N/A	153.9	142,133	100,283	242,416
Blue River	Municipal	N/A	173.8	131,199	91,217	222,416
Velma PFO	Wildhorse Creek	VE9.7	VE9.5	16,489	6,445	22,934
Highway 76	Wildhorse Creek	VE9.7	VE11.5	20,105	7,800	27,905
		Total		**1,559,053**	**1,084,349**	**2,643,402**

[a] Hydrostatic test water would be discharged at a rate of 1,500 gallons per minute to an upland site.

During the HDD operations, the drilling mud returns would be circulated through mud pits to remove the drill cuttings, and the bentonite would be recycled for use as the drilling operation continues. As described in the HDD Plan (see appendix F), after completion of an HDD, the recovered drilling mud may be recycled for use at subsequent drill sites, beneficially used on site for soil amendments, provided to a third party to be beneficially reused as fill or a soil amendment to agricultural fields, or disposed of at a commercial disposal site authorized for management of such wastes. If a non-municipal water source is used or if drilling mud encounters previously unidentified contamination, it is possible that drilling mud could become contaminated during HDD operations; therefore, **we recommend that:**

- **Prior to construction, Midship Pipeline should file with the Secretary, for review and written approval by the Director of OEP, an updated HDD Plan that revises section 10.4.2 to confirm it would test all non-municipal water sources prior to being used for drilling mud and that revises section 10.4.4 to confirm it would conduct laboratory sampling of drilling fluid for inorganic and organic environmental contaminants prior to reuse or disposal.**

In addition, Midship Pipeline would conduct hydrostatic testing of the HDD segments prior to pull-back. Midship Pipeline estimates that a total of 1.08 million gallons of water would be required to hydrostatically test all of the HDD segments. Upon completion of the hydrostatic test, the water would either be pumped to the next segment for testing or discharged to an upland location at a rate of

1,500 gallons per minute through an energy-dissipating device in compliance with NPDES permit conditions. Table 4.3.2-6 details the water requirements associated with HDD operations and for hydrostatic testing each HDD segment.

Dust Control

Given the length of the proposed pipeline and that weather conditions would play a large role in water requirements, it is difficult to predict how much water would ultimately be needed for dust suppression. Midship Pipeline proposes to withdraw about 73,681,545 gallons of water from 9 streams and 17 ponds or lakes for dust control activities, as detailed in table 4.3.2-7. Water would be transported to the project workspace by truck. Midship Pipeline would complete dust control activities in compliance with all applicable permits and regulations. See section 4.11.1.3 for more information regarding measures to control fugitive dust emissions during construction activities.

TABLE 4.3.2-7

Dust Control Water Requirements for the MIDSHIP Project

Withdrawal Source	Type	Milepost	Estimated Volume (gallons)
Uncle John Creek Site 13 Reservoir	Lake	7.0	3,012,876
Large Lake	Lake	11.1	1,556,652
Stream Crossing	Stream	16.4	2,075,536
Ranch Pond	Pond	2.2	2,577,682
Injection Water Storage Pond	Pond	11.2	3,029,614
Ranch Pond	Pond	20.3	3,933,476
Stream Crossing	Stream	34.8	5,121,888
Ranch Pond	Pond	50.9	4,351,931
Winter Creek Site 9 Reservoir	Lake	60.6	2,360,088
Washita River Crossing	Stream	65.0	1,707,296
Ranch Pond	Pond	71.0	1,874,678
Round Creek Site 4 Reservoir	Lake	76.2	2,560,944
Ranch Pond	Pond	86.1	2,109,013
Wild Horse Creek Site 90 Reservoir	Lake	88.8	2,678,112
Wild Horse Creek Site 10 Reservoir	Lake	102.3	3,548,498
Caddo Creek Site 7 Reservoir	Lake	110.0	3,012,876
Henry House Creek Crossing	Stream	120.2	2,711,588
Ranch Pond	Pond	126.1	2,627,897
Washita River Crossing	Stream	135.9	2,577,682
Washita River Adjacent	Stream	141.1	2,644,835
Rock Creek Crossing	Stream	151.7	3,012,876
Ranch Pond	Pond	159.5	3,833,047
Oknoname 013015 Reservoir	Lake	174.6	4,469,099
Stream Crossing	Stream	186.1	2,845,494
Stream Crossing	Stream	191.5	2,175,966
Ranch Pond	Pond	199.3	1,272,103
Total			**73,681,545**

4.3.2.6 Surface Water Impacts and Mitigation

Open-Cut Crossings

Pipeline construction activities that could potentially affect surface waters include clearing and grading of streambanks, in-stream trenching, blasting, trench dewatering, inadvertent returns from HDD operations, and potential spills or leaks of hazardous materials. Potential effects on surface waters may include:

- modification of aquatic habitat;
- increased runoff and the rate of in-stream sediment loading;
- turbidity;
- decreased dissolved oxygen concentrations;
- releases of chemical and nutrient pollutants from sediments;
- thermal effects;
- modification of riparian areas; and
- introduction of chemical contaminants such as fuel and lubricants.

The primary impacts of construction on surface waters would be increases in sediment loads, especially during in-stream activities, such as trenching and backfilling. The extent of the impact and sediment migration would vary depending on amount of sediment load, stream velocity, turbidity, bank composition, and particle size. These factors would determine the density and downstream extent of sediment migration. In-stream construction could also result in the alteration of stream bed contours, which could modify stream dynamics and increase downstream erosion or deposition. The effects of which could eventually alter the stream's course within the local area.

In-stream construction, streambank alteration, dewatering activities, and soil erosion from nearby construction could increase turbidity levels, leading to reduced light penetration and photosynthetic oxygen production within the waterbody. In-stream disturbance could also introduce chemical and nutrient pollutants from sediments. Resuspension of deposited organic material and inorganic sediments may cause an increase in biological and chemical use of oxygen, potentially resulting in a decrease of dissolved oxygen concentrations in the affected area. Lower dissolved oxygen concentrations could cause temporary displacement of motile organisms, such as fish, and may kill non-motile organisms within the affected area.

The clearing and grading of streambanks during construction would reduce riparian vegetation and could result in the erosion and transport of sediment into waterbodies. The use of heavy equipment in cleared and graded areas could contribute to soil compaction, which may also result in increased surface runoff. Increased surface runoff could transport sediment from uplands into surface waters, resulting in increased turbidity levels and increased sedimentation rates in the receiving waterbody. In addition, the removal of riparian vegetation, and thus shading, could lead to an increase in water temperature.

Accidental leaks or spills of hazardous materials, which can occur during refueling and maintenance of vehicles or storage of fuel, oil, and other hazardous materials could create the potential for contamination. If a spill were to occur, there would be an immediate degradation in water quality downstream. Depending on the size of the spill, there is potential to affect waters outside the immediate area if hazardous materials are carried through surface water flow, stormwater runoff, or groundwater.

Midship Pipeline would minimize effects on surface waters during construction by implementing the construction and mitigation measures contained in the Procedures, which include:

- minimizing the amount of streambed and bank disturbance;

- constructing the crossing as close to perpendicular to the axis of the waterbody channel as engineering and routing conditions allow;
- maintaining adequate flow rates throughout construction to protect aquatic life and prevent the interruption of existing downstream uses;
- discharging water during dewatering activities at a controlled rate and through appropriate filtration to a relatively flat upland area for evaporation and infiltration back to the water table;
- parking and fueling equipment at least 100 feet from a waterbody or in an upland area at least 100 feet from the edge of a waterbody, occurring closer only if the EI determines that there is no reasonable alternative, and that appropriate steps would be taken to prevent spills and provide for prompt cleanup in the event of a spill;
- storing hazardous materials, including chemicals, fuels, and lubricating oils, greater than 100 feet from a waterbody unless the location is designated for such use by an appropriate governmental authority;
- implementing Midship Pipeline's SPRP in the event of a spill or leak during construction;
- maintaining and reinstalling as necessary, temporary erosion and sediment control measures throughout construction until streambanks and adjacent upland areas are stabilized or permanent control measures are in place;
- completing construction (not including blasting and other rock breaking measures) within 48 hours, unless site-specific conditions make completion within 48 hours infeasible; and
- restoring bed and banks to preconstruction contours or to a stable angle of repose as approved by the EI as soon as possible following construction activity within the waterbody.

Midship Pipeline has proposed to cross a major waterbody (unnamed pond S-JO-RFT-17/02/03-02) using the wet open-cut method at Mainline MP 149.2. In the draft EIS, we recommended that Midship Pipeline assess the feasibility of shifting the pipeline route to avoid the unnamed pond. In its response to our recommendation, Midship Pipeline indicated that it is negotiating an easement with the landowner, who has not objected to the proposed crossing method. In addition, Midship Pipeline has committed to restoring the unnamed pond to preconstruction conditions. Therefore, we find the proposed crossing method acceptable.

In addition, Midship Pipeline has proposed to cross a second major waterbody (unnamed tributary to Caddo Creek [S-BR-TAS-17/10/25-07]) at Mainline MP 181.1 using the wet open-cut method. This ephemeral stream was not identified in the draft EIS because Midship Pipeline had not yet completed field surveys on the property. The stream, which was identified during subsequent field surveys conducted between November 2017 and January 2018, is 11 feet wide and runs parallel to and intersects the proposed pipeline centerline for a distance of about 102 feet before exiting the right-of-way. To reduce the potential environmental impacts associated with this major open-cut crossing, **we recommend that:**

- **Prior to construction, Midship Pipeline should file with the Secretary, for review and written approval by the Director of OEP, the results of a feasibility assessment for shifting the pipeline alignment to minimize the crossing length of waterbody S-BR-**

TAS-17/10/25-07 at Mainline MP 181.1, or implementing an alternative crossing method (e.g., dam-and-pump, flume, HDD).

Midship Pipeline would stabilize streambanks within 24 hours of completing in-stream construction activities, restoring stream flow functionality. Streambanks would be revegetated following installation of the pipeline, and post-construction vegetation maintenance would be conducted in accordance with the Plan and Procedures. No long-term effects associated with operation and maintenance of the pipelines are anticipated.

HDD Crossings

The potential effects on waterbodies crossed using the HDD method would be minor because the pipeline would be installed below the bed and banks of the waterbody and the HDD method would avoid clearing a majority of riparian vegetation and trenching within the bed and banks of the waterbody. Midship Pipeline would conduct limited hand clearing of vegetation as needed between the HDD entry and exit points to facilitate placement of electric guidewires and/or for rubber tired vehicles to carry hoses or pumps to access approved water sources.

We received a comment requesting that Midship Pipeline use the HDD method to install the pipeline across all waterbodies. The HDD method generally eliminates the majority of direct impacts on waterbodies during construction, and Midship Pipeline has proposed to use the HDD method at the most sensitive waterbody crossings. However, the feasibility of using the HDD method is based on a number of factors, including length of the HDD, pipeline diameter, geologic conditions, surrounding terrain/topography, and available workspace on the entry and exit sides of the HDD to stage the equipment and assemble the length of pipeline necessary to complete the installation. The HDD method also typically requires additional construction time for each crossing. Based on our experience, the minimum length of pipeline that can be installed using this construction method is between 1,150 and 1,500 feet. Therefore, we determined that use of the HDD method to install the pipeline across all waterbodies would not be feasible and/or practical.

The primary effect that could result from use of the HDD method would be an inadvertent release of drilling fluid (or drilling mud) directly or indirectly into the waterbody. During an HDD, drilling fluid may leak through previously unidentified fractures in the material underlying the river bed, in the area of the mud pits or tanks, or along the drill path due to unfavorable soil/bedrock conditions. Although drilling fluid consists of non-toxic materials, in large quantities the release of drilling fluid into a waterbody could affect fisheries or other aquatic organisms by causing turbidity and/or temporarily coating the streambed with a layer of clay. The probability of an inadvertent release is greatest when the drill bit is working near the surface (i.e., near the entry and exit points).

Midship Pipeline's HDD Plan describes how the HDD operations would be monitored for potential inadvertent returns. The HDD Plan also includes general procedures for the containment and cleanup of drilling mud, should a release occur during HDD operations. Section 13.3 of the HDD Plan describes response measures Midship Pipeline would implement in the event of an inadvertent release of drilling mud within a waterbody, including the immediate suspension of drilling operations if the released volume is determined to pose a threat to human health and safety. As described in section 4.3.2.4, the Canadian River (MP 28.4) supports the federally listed Arkansas River shiner, and is designated critical habitat for this species. Potential impacts on the Arkansas River shiner associated with this crossing are described in section 4.7.1.6.

In the event of an unsuccessful drill hole, a new HDD path would be determined and the unsuccessful hole would be abandoned and sealed. Grout would be pumped into the hole to completely seal and fill it, except for the top 5 feet where compacted soil would be placed within the hole. As described above and in section 4.3.2.4, the Blue River is listed on the Nationwide Rivers Inventory at the proposed crossing location. Because Midship Pipeline proposes to cross the Blue River using the HDD method, and both the entry and exit points would be set back at least 700 feet from the waterbody, impacts on this waterbody are not anticipated.

Midship Pipeline's HDD Plan includes site-specific discussions for each HDD crossing and Midship Pipeline provided site-specific HDD alignment sheets. However, Midship Pipeline has not conducted geotechnical analysis for the Henry House Creek HDD due to lack of survey permission and, additionally, Midship Pipeline indicated that detailed HDD layouts would not be available until after the selected drilling contractor(s) has evaluated each individual drill site. Therefore, **we recommend that:**

- **Prior to construction, Midship Pipeline should file with the Secretary, for review and written approval by the Director of OEP, a complete set of revised HDD profile and plan drawings, including all geotechnical analyses and detailed mapping of cleared areas, mud pits, and/or pipe assembly areas, as required in the Commission's Procedures section V.B.6.d.**

With the above measures in place and our recommendations, we conclude that use of the HDD construction method as proposed would not significantly affect surface water resources.

Blasting

As noted in section 4.3.2.5, three waterbodies along the proposed Mainline contain shallow bedrock and may require blasting during construction (see table 4.3.2-4). If blasting in waterbodies is required, there is a potential for permanent alterations of stream channels. In-stream blasting also has the potential to injure or kill aquatic organisms, displace organisms during the blast-hole drilling operations, and temporarily increase stream turbidity. Midship Pipeline prepared a project-specific *Blasting Plan* (see appendix I). We have reviewed Midship Pipeline's *Blasting Plan* and conclude that it is acceptable. Midship Pipeline would also require its construction contractor to develop site-specific blasting plans for each waterbody crossing where blasting is determined to be necessary (see section 4.1.6 for additional information about blasting) and would obtain blasting permits from appropriate agencies. In addition, in accordance with the Procedures, Midship Pipeline would file with the Secretary a schedule identifying when blasting would occur within any waterbody greater than 10 feet wide. With these measures, we conclude that blasting, if required, would not result in significant impacts on waterbodies.

Floodplain Crossings

Executive Order 11988, Floodplain Management, requires each federal agency to evaluate the potential effects of any action it may take in a floodplain. None of the proposed aboveground facilities are in a FEMA-designated floodplain (FEMA, 2017). Floodplains that would be crossed by the pipelines could be temporarily affected by trenching and spoil piles. The overall flood retention capacity would be unchanged; however, the presence of the spoil piles would temporarily alter surface drainage and could redirect flows within the floodplain area. Floodplains would not be affected by the operation of the buried pipeline. Seasonal and flash flooding hazards are a potential concern where the pipeline would cross or be near major waterbodies. Although flooding itself does not generally present a risk to pipeline facilities, bank erosion and/or scour could expose a portion of pipeline, or cause sections of pipe to become unsupported.

Sixty-eight waterbody crossings would be within FEMA-designated floodplains (FEMA, 2017). All pipeline facilities would be designed and constructed in accordance with 49 CFR 192. These regulations include specifications for installing the pipelines at a sufficient depth to avoid possible scour at waterbody crossings. The trench would be sufficiently deep to provide for a minimum of 5 feet of cover over the pipeline at waterbodies (or 18 inches when constructing in bedrock).

During scoping, the OWRB, which coordinates the Oklahoma Dam Safety Program, requested that Midship Pipeline submit Dam Safety Permit applications for any portions of the project that occur within 50 feet of any dam of jurisdictional size (which is based on dam height and storage capacity). Midship Pipeline has stated that no known portions of the project would be within 50 feet of a dam of jurisdictional size. Therefore, the project would have no impact on jurisdictional dams.

Public Water System Intakes

As described in section 4.3.2.2, the Mainline would cross Pennington Creek about 2.2 miles upstream from a Public Water System intake for the City of Tishomingo. Midship Pipeline will continue to coordinate with the City of Tishomingo regarding mitigation of potential impacts on the public water supply; however, the City of Tishomingo stated that the information provided by Midship Pipeline appeared to consider best environmental practices to protect the water intake. Because the water intake is 2.2 miles downstream from the crossing location, Midship Pipeline would use the HDD method to install the Mainline beneath Pennington Creek, and with implementation of the measures in its SPRP and the Procedures, we conclude that no direct impacts on the public water intake would occur.

Access Roads

Proposed improvements and maintenance to existing, temporary access roads could temporarily affect 15 waterbodies. While no in-stream construction is proposed, activities near surface waters could result in indirect impacts. Potential impacts on surface waters associated with these maintenance and improvement activities could include bank disturbance, minor increases in siltation, and bank vegetation disturbance. This could lead to increased sediment loading in streams, destabilizing stream banks, and altering riparian habitat. Such impacts would be avoided and minimized by using existing roads and locating access roads in agricultural and open lands to the extent practicable. Midship Pipeline would conduct all access road improvements and waterbody crossings in accordance with applicable federal, state, and local permits and regulations. Following construction, all temporary access roads would be restored to their preconstruction conditions; no permanent impacts on surface waters would occur as a result of access road development and use. As such, effects on surface waters associated with the proposed access roads would be temporary and minor.

Aboveground Facilities

One intermittent stream is within the ATWS associated with the Velma Meter Station and one ephemeral stream is about 60 feet southeast of the proposed construction area at the Bennington Compressor Station. Midship Pipeline would implement the Plan and Procedures during construction of the Velma Meter Station and Bennington Compressor Station, which include mitigation measures to protect streams during construction. As a result, we conclude that construction of the Velma Meter Station and Bennington compressor station would have minimal to no impact on these waterbodies.

During operation, impacts on surface water would be limited to the appropriation of water for general and sanitary purposes and for periodic washing of the turbines at the three compressor stations. This water would be obtained from a municipal source. Wastewater associated with general and sanitary

use would be treated on site and disposed of using on-site spray irrigation. The water associated with turbine washing would be loaded onto trucks periodically and disposed of off site.

Hazardous Material Spills

Accidental spills and leaks of hazardous materials associated with equipment, the refueling or maintenance of vehicles, and the storage of fuel, oil, and other fluids can have immediate effects on aquatic resources and could contaminate waterbodies downstream of the release point. Midship Pipeline would implement the Procedures and the SPRP to avoid or minimize effects associated with spills or leaks of hazardous liquids. These plans include storing hazardous materials away from wetlands and waterbodies, restricting refueling within 100 feet of wetlands and waterbodies, and the use of secondary containment structures for petroleum products. Midship Pipeline's SPRP also specifies routine inspections for storage tanks; spill response kits on every vehicle that transports fuel; and measures to contain, clean up, and properly dispose of spills. We conclude the implementation of these plans and measures would adequately address the storage and transfer of hazardous materials and petroleum products, and the appropriate response in the event of a spill.

Extra Workspaces Within 50 Feet of Waterbodies

As described in section 2.3, our Procedures stipulate that all ATWS should be at least 50 feet from waterbodies, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. However, Midship Pipeline has identified 24 locations where site-specific conditions do not allow for a 50-foot setback. The locations where these modifications from our Procedures are requested, Midship Pipeline's explanation of the need for the ATWS, and our evaluation of each request are included in table 4.3.2-8.

Based on our review, we have determined that Midship Pipeline has provided adequate justification for the majority of the requested ATWSs. However, additional explanation is necessary for us to complete our evaluation of Midship Pipeline's request for certain ATWS within 50 feet of some waterbodies. Therefore, **we recommend that:**

- **Prior to construction, Midship Pipeline should file with the Secretary additional justification for use of the ATWS associated with the waterbodies identified in bold in table 4.3.2-8 of the EIS, for review and written approval by the Director of OEP.**

4.3.2.7 Conclusion

Construction and operation of the MIDSHIP Project would have no long-term effects on surface waters. The project would not permanently affect designated water uses because the pipelines would be buried beneath the bed of the waterbodies, erosion controls would be implemented during construction, and streambanks and streambed contours would be restored as close as practicable to preconstruction conditions.

Midship Pipeline would conduct pipeline construction activities in accordance with the Plan and Procedures, as well as Midship Pipeline's SPRP, HDD Plan, and *Blasting Plan*, where appropriate. With these protective measures in place, and our additional recommendations, we conclude that construction and operation of the project would not result in significant impacts on surface water resources.

The operation of the new project facilities would not result in any impacts on surface water use or quality unless maintenance activities involving pipe excavation and repair in or near streams are required. In such a case, the impacts would be similar to those described for pipeline construction.

TABLE 4.3.2-8

Justification for Additional Temporary Workspaces Within 50 Feet of Waterbodies for the MIDSHIP Project[a]

Facility/ Waterbody I.D.	ATWS Milepost	Midship Pipeline's Justification	FERC Comments
Mainline			
AS-CN-NWI-PUBHh-336	15.8	Water access for hydrostatic testing.	The request for ATWS within 50 feet of the waterbody appears justified.
AS-GR-NHD-WB-335	60.5	Water access for hydrostatic testing.	The request for ATWS within 50 feet of the waterbody appears justified.
AS-ST-NHD-WB-334	88.8	Water access for hydrostatic testing.	The request for ATWS within 50 feet of the waterbody appears justified.
AS-GA-NHD-WB-333	92.4	Water access for hydrostatic testing.	The request for ATWS within 50 feet of the waterbody appears justified.
S-CR-RKT-17/06/28-02	110.9	Water access for hydrostatic testing.	The request for ATWS within 50 feet of the waterbody appears justified.
S-JO-LAG-17/06/29-01, S-CR-LAG-17/01/05-02	124.8	The proposed ATWS is in the most advantageous place for the stream crossings and points of inflection. Adherence to the Procedures would avoid impacts on the stream.	The request for ATWS within 50 feet of the waterbody appears justified.
S-CR-LAG-17/01/05-01	124.8	The proposed ATWS is in the most advantageous place for the stream crossing and point of inflection. Adherence to the Procedures would avoid impacts on the stream.	The request for ATWS within 50 feet of the waterbody appears justified.
S-CR-LAG-17/01/05-02, S-CR-LAG-17/01/05-02b	124.9	The proposed ATWS is in the most advantageous place for the stream crossings. Adherence to the Procedures would avoid impacts on the stream.	The request for ATWS within 50 feet of the waterbody appears justified.
S-CR-LAG-17/01/05-89	126.1	Water access for hydrostatic testing.	The request for ATWS within 50 feet of the waterbody appears justified.
S-JO-LAG-17/01/10-06	151.1	A false right-of-way would be required for the pull-back string for the Rock Creek HDD; no alternatives are available. Adherence to the Procedures would avoid impacts on the ephemeral stream.	The request for ATWS within 50 feet of the waterbody appears justified.
S-JO_AJF-17/01/11-01 S-JO-AJF-17/01/11-02	153.6	A false right-of-way would be required for the pull-back string for the Pennington Creek HDD; no alternatives are available. Adherence to the Procedures would avoid impacts on the intermittent stream.	The request for ATWS within 50 feet of the waterbody appears justified.
S-JO-EHK-17/01/13-10a, S-JO-EHK-17/01/13-10b, S-JO-EHK-17/01/13-10d	157.8	The proposed ATWS is in the most advantageous place for the crossing of Big Sandy Creek and is in line with two other ATWSs needed on the working side. Adherence to the Procedures would avoid impacts on the ephemeral stream.	The request for ATWS within 50 feet of the waterbody appears justified.
S-JO-EHK-17/01/13-10a	157.9	The proposed ATWS is in the most advantageous place for the crossing of Big Sandy Creek and is in line with two other ATWSs needed on the working side. Adherence to the Procedures would avoid impacts on the ephemeral stream.	The request for ATWS within 50 feet of the waterbody appears justified.

TABLE 4.3.2-8 (cont'd)

Justification for Additional Temporary Workspaces Within 50 Feet of Waterbodies for the MIDSHIP Project

Facility/ Waterbody I.D.	ATWS Milepost	ATWS Justification	FERC Comments
S-BR-TAS-17/10/25-04	**173.8**	**The proposed workspace would be required for placing equipment to facilitate the HDD to cross the Blue River.**	**Provide additional site-specific information regarding why the ATWS and/or HDD cannot be shifted to provide an additional buffer immediately adjacent to the waterbody.**
S-BR-TAS-17/01/16-02	174.6	Water access for hydrostatic testing and to support point of inflection.	The request for ATWS within 50 feet of the waterbody appears justified.
S-BR-AAL-17/01/14-02	175.9	The proposed ATWS is in the most advantageous place for the stream crossing and to avoid the pond. Adherence to the Procedures would avoid impacts on the stream.	The request for ATWS within 50 feet of the waterbody appears justified.
Chisholm Lateral			
S-KI-WCR-17/10/24-01	CH7.1	Water access for hydrostatic testing.	The request for ATWS within 50 feet of the waterbody appears justified.
Velma Lateral			
S-ST-WCR-17/04/11-03	**VE0.7**	**The proposed ATWS is in the most advantageous place for the stream crossing and is restricted in location by another waterbody. Adherence to the Procedures would avoid impacts on the stream.**	**Provide additional site-specific information regarding why the ATWS cannot be reduced in length to provide an additional buffer immediately adjacent to the waterbody.**
S-ST-WCR-17/04/11-02	VE1.0	The proposed ATWS is in the most advantageous place for the stream crossing and is restricted in location by a point of inflection in the proposed route. Adherence to the Procedures would avoid impacts on the stream.	The request for ATWS within 50 feet of the waterbody appears justified.
S-ST-WCR-17/04/11-04	VE2.0	The proposed ATWS is in the most advantageous place for the stream crossing and is only a few feet inside the 50-foot limit in an attempt to avoid a part of a stand of trees. Adherence to the Procedures would avoid impacts on the stream	The request for ATWS within 50 feet of the waterbody appears justified.
S-ST-RFT-17/04/10-13	VE7.0	The proposed ATWS is in the most advantageous place for the combination of the road and pipeline crossing and the point of inflection; the pond is within the permanent and temporary construction right-of-way.	The request for ATWS within 50 feet of the waterbody appears justified.
AS-CR -NHD-Line-969	VE9.8	Water access for hydrostatic testing.	The request for ATWS within 50 feet of the waterbody appears justified.
S-GA-WCR-17/04/10-02a, S-GA-WCR-17/04/10-02b, S-GA-WCR-17/04/10-02c	VE13.3	The proposed ATWS is in the most advantageous place for facilitating multiple stream crossings.	The request for ATWS within 50 feet of the waterbody appears justified.
Aboveground Facilities			
S-ST-WCR-17/04/11-01	VE0.2	Velma Meter Station construction and stream crossing would require extra workspace.	The request for ATWS within 50 feet of the waterbody appears justified.

4.4 WETLANDS

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation adapted for life in saturated soil conditions (Environmental Laboratory, 1987). Examples of wetlands include swamps, marshes, and bogs. Wetlands serve important biological, physical, and chemical functions, including providing wildlife food and habitat, recreation opportunities, flood control, erosion control, and water quality improvement.

Wetlands in the project area are regulated at the federal and state levels. At the federal level, the COE has authority under section 404 of the CWA to review and issue permits for activities that would result in the discharge of dredged or fill material into waters of the United States, including wetlands. The EPA has authority to review and veto permits issued by the COE under section 404 of the CWA. Section 401 of the CWA requires that proposed dredge and fill activities under section 404 be reviewed and certified by the designated state agency so that the proposed project would meet state water quality standards. In Oklahoma, the designated lead state agency administering the program is the ODEQ.

4.4.1 Existing Wetland Resources

Midship Pipeline conducted pedestrian wetland delineations along the proposed pipeline routes from December 2016 through February 2017. Wetland boundaries were delineated using the methods described in the 1987 *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region* (Version 2.0) (COE, 2010). As of May 2018, 98 percent of the project area has been surveyed in the field. For the remaining 3 percent where Midship Pipeline was unable to delineate wetlands in the field, Midship Pipeline used desktop analysis to estimate the wetland resources and boundaries within the project area. Desktop analysis was conducted using the following data sources:

- USGS topographical maps;
- aerial photography;
- NRCS soil survey data; and
- FWS National Wetlands Inventory data.

As discussed further in section 4.4.4, construction and operation of the proposed pipelines would affect about 3.6 and 0.2 acres of wetlands, respectively, including wetlands within the construction right-of-way and ATWS. Detailed information about each wetland potentially affected by the project is provided in table 4.4.1-1. No wetlands are present within the boundaries of the proposed aboveground facility sites, contractor yards, or access roads.

4.4.2 Wetland Classifications

Wetlands were classified according to the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979). This widely used system classifies wetlands based on systems (e.g., palustrine, marine) and vegetation classes (e.g., emergent, forested). Three types of palustrine (freshwater) wetlands were delineated in the project area and are described below. Ponds are discussed in section 4.3.2.

TABLE 4.4.1-1

Wetlands Crossed by the MIDSHIP Project

Facility/Wetland Name	Wetland Type	Approximate Milepost	Length of Crossing (feet) [a]	Acres Within Construction Workspace	Acres Within Operational Workspace
Mainline					
W-CN-LAG-17/01/18-02	PFO	15.6	0.0 [b]	0.1 [b]	0.1 [b]
W-CN-WCR-16/12/08-01	PFO	17.3	36.0	0.1	<0.1
W-CN-TAS-17/01/19-01	PFO	18.2	43.2	0.1	<0.1
W-CN-AAL-17/01/18-01	PEM	19.3	30.2	0.1	0.1
W-GR-WCR-16/12/10-01	PEM	34.8	93.4	0.2	0.1
W-GR-EHK-17/01/19-04	PEM	56.3	8.8	<0.1	<0.1
W-GR-EHK-17/01/19-02	PEM	56.4	37.3	<0.1	<0.1
W-GR-EHK-17/01/19-01	PEM	56.5	0.0	<0.1	<0.1
W-GR-WCR-16/12/13-03	PEM	74.3	39.6	<0.1	<0.1
W-GA-WCR-16/12/15-01	PEM	79.2	29.6	0.1	<0.1
W-GA-EHK-17/01/10-09	PEM	100.0	0.0	<0.1	<0.1
W-CR-LAG-17/01/16-03	PSS	115.1	42.1	0.1	0.1
W-CR-AAL-17/01/16-99	PEM	116.4	29.7	<0.1	<0.1
W-CR-LAG-17/01/16-02	PEM	116.5	80.7	0.1	0.1
W-CR-LAG-17/01/16-01	PEM	116.9	30.7	0.1	0.1
W-CR-AJF-17/01/16-01	PEM	117.7	154.2	0.3	0.2
W-CR-LAG-17/01/08-01	PEM	126.2	31.7	<0.1	<0.1
W-CR-LAG-17/01/08-02	PEM	126.5	11.7	<0.1	<0.1
W-CR-LAG-17/01/08-03	PSS	126.9	71.4	0.1	0.1
W-CR-LAG-17/01/09-02	PEM	130.1	22.1	<0.1	<0.1
W-CR-LAG-17/01/09-03	PEM	130.1	15.0	<0.1	<0.1
W-CR-LAG-17/01/10-01	PEM	137.2	0.0	<0.1	<0.1
W-JO-AAL-17/01/20-02	PSS	139.3	0.0	<0.1	<0.1
W-JO-LAG-17/01/10-02	PEM	150.6	4.0	<0.1	<0.1
W-JO-AJF-17/01/11-05	PSS	153.3	0.0	<0.1	<0.1
W-JO-EHK-17/01/13-02	PEM	158.3	16.7	<0.1	<0.1
W-JO-LAG-17/01/13-01	PSS	158.7	21.3	0.1	<0.1
W-JO-AJF-17/01/13-02	PSS	161.5	190.3	0.3	0.2
W-JO-AJF-17/01/13-01	PSS	161.8	0.0	<0.1	<0.1
W-JO-AJF-17/01/13-01	PEM	161.8	378.6	0.6	0.4
W-JO-AJF-17/01/13-04	PEM	162.0	0.0	<0.1	<0.1

TABLE 4.4.1-1 (cont'd)

Wetlands Crossed by the MIDSHIP Project

Facility/Wetland Name	Wetland Type	Approximate Milepost	Length of Crossing (feet) [a]	Acres Within Construction Workspace	Acres Within Operational Workspace
W-BR-TAS-17/01/12-01	PEM	187.0	28.8	<0.1	<0.1
AW-BR-RKT-17/01/12-01	PEM	194.3	6.3	<0.1	<0.1
W-BR-RKT-17/01/12-01	PEM	194.3	9.2	0.1	<0.1
AW-BR-NWI-PEM1F-195	PEM	195.6	222.3	0.3	0.2
Mainline Subtotal [b]			**1,664.9**	**3.0**	**2.0**
Chisholm Lateral					
W-KI-RKT-17/07/12-10	PEM	CH8.5	25.3	<0.1	<0.1
W-KI-TAS-17/01/17-01	PEM	CH10.4	45.8	0.1	<0.1
W-KI-TAS-17/01/17-01	PEM	CH10.5	0.0	<0.1	0.0
W-KI-AAL-17/01/17-01	PEM	CH15.7	31.7	0.1	<0.1
Chisholm Lateral Subtotal [b]			**102.8**	**0.3**	**0.1**
Velma Lateral					
W-ST-RKT-17/04/11-23	PEM	VE4.4	164.5	0.3	0.2
W-CR-RFT-17/04/11-01	PFO	VE9.4	0.0 [b]	0.0	0.0
W-CR-TAS-17/10/27-03	PSS	VE11.4	0.0 [b]	0.0	0.0
Velma Lateral Subtotal [b]			**165.4**	**0.3**	**0.2**
PROJECT TOTAL [c]			**1,952.2**	**3.5**	**2.3**

[a] A crossing length of 0.0 feet indicates the wetland would not be directly crossed by the pipeline centerline; however, wetlands may occur within the construction workspaces.

[b] Wetland will be crossed using the HDD method. Impacts within this wetland would be limited to hand clearing to create a footpath for personnel to lay an HDD guide wire between the entry and exit points.

[c] Totals may not match the sum of addends due to rounding.

Palustrine Emergent Wetlands

Freshwater wetlands dominated by herbaceous vegetation are classified as palustrine emergent (PEM). Vegetation is present for most of the growing season in most years, and stands erect above the water or ground surface. Scattered shrubs and trees may be present in PEM wetlands, but account for less than 30 percent of the vegetation cover (Cowardin et al., 1979). Typical plant species within PEM wetlands along the proposed pipeline routes include cattails, smartweeds and knotweeds, flatsedges, spikerushes, rushes, Virginia wild-rye, bushy bluestem, broad-leaf wood-oats, plowman's-wort, seed-box, and white snakeroot.

Palustrine Scrub-shrub Wetlands

Palustrine scrub-shrub (PSS) wetlands are dominated by shrubs and saplings less than 20 feet tall. Although PSS wetlands are composed largely of true shrubs, they may also contain young trees as well as trees or shrubs that are small or stunted because of environmental conditions (Cowardin et al., 1979). This cover type occurs naturally as a transitional community, as part of a forested patchwork, or in areas where

natural environmental conditions do not allow the growth of mature trees. PSS wetlands along the proposed pipeline routes are small (less than 0.5 acre in size) and are typically composed of Roosevelt-weed, pale dogwood, rusty blackhaw, common buttonbush, sandbar willow, and winged elm.

Palustrine Forested Wetlands

Palustrine forested (PFO) wetlands are dominated by trees and shrubs at least 20 feet tall with a tolerance for a seasonally high water table. Forested wetlands typically have a mature tree canopy with a diverse range of understory and herbaceous community structure and species (Cowardin et al., 1979). The majority of the PFO wetlands along the proposed pipeline routes are near the crossings of Oil Creek and West Fork Sandy Bear Creek, although several small PFO wetlands are present elsewhere along the route. PFO wetlands within the project area are commonly dominated by black willow, eastern cottonwood, sugarberry, and American elm.

4.4.3 Wetland Construction Procedures

Construction of the project would require 42 wetland crossings, 3 of which would be conducted using the HDD method. Within wetland boundaries, Midship Pipeline would implement the Procedures and limit the construction right-of-way width to 75 feet. Where hydrologic conditions allow, Midship Pipeline would segregate up to 1 foot of topsoil; however, where saturated soil conditions are present, topsoil segregation would not be implemented.

4.4.4 General Impacts and Mitigation

Table 4.4.4-1 summarizes the impacts of the proposed project on wetlands. Construction would affect a total of 3.5 acres of wetlands, including 2.7 acres of PEM wetlands, 0.6 acre of PSS wetlands, and 0.1 acre of PFO wetlands. The majority of impacts on wetlands resulting from construction and operation of the project would be temporary. In accordance with the Procedures, Midship Pipeline would maintain an herbaceous corridor up to 10 feet wide centered on the pipeline to facilitate periodic corrosion/leak surveys and would selectively cut trees within 15 feet of the pipeline with roots that could compromise the integrity of pipeline coating. As a result, although 2.3 acres of wetlands would be within the project's operational workspace, impacts on wetlands during operation of the project would be limited to the conversion of 0.1 acre of PSS wetland to PEM wetland, and 0.1 acre of PFO wetlands to PSS and PEM wetlands. No impacts on wetlands would occur during construction or operation of the proposed aboveground facilities, contractor yards, or access roads. The project would not result in any permanent loss of wetlands.

TABLE 4.4.4-1

Wetland Acreages Affected by the Construction and Operation of the MIDSHIP Project[a]

	PEM		PSS		PFO		Total	
Facility	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.
Mainline	2.2	0.0	0.6	0.1	0.2	0.1	3.0	0.1
Chisholm Lateral	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.0
Velma Lateral	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.0
Project Total	**2.7**	**0.0**	**0.6**	**0.1**	**0.2**	**0.1**	**3.5**	**0.1**

[a] Acreages presented may not reflect the totals/subtotals presented in table 4.4.1-1. Wetland acreages affected during construction may differ due to rounding. Wetland acreages affected during operation would differ because the majority of wetlands within the operational workspace would not be affected by operation of the project.

The primary impact of pipeline construction and right-of-way maintenance activities on wetlands would be the temporary, short-term, and long-term alteration of wetland vegetation and permanent conversion of PFO wetlands to PSS or PEM wetlands and of PSS wetlands to PEM wetlands. Impacts on wetlands would be greatest during and immediately following construction. Following construction, new wetland vegetation would become established and eventually revert to a plant community similar to the one that existed prior to construction, except where PSS or PFO wetlands within the permanent maintained right-of-way would be converted to different wetland types. Wetlands would be allowed to revegetate naturally from available native seed stock.

During construction, failure to segregate topsoil could result in the mixing of topsoil with the subsoil. This could alter nutrient availability and soil chemistry, thereby inhibiting recruitment of native wetland vegetation after restoration. Secondary or indirect impacts could include reduced riparian buffers, disturbance to adjacent habitats, and incremental fragmentation of forested wetlands.

Other direct impacts associated with construction of the project could include local, temporary changes in wetland hydrology and water quality. Increases in turbidity would likely occur during trenching within the wetland, and could potentially be caused by erosion and sediment-laden stormwater runoff from nearby disturbed areas. Temporary removal of wetland vegetation during construction could alter the capacity of wetlands to function as habitat and flood and erosion control buffers. Heavy equipment operating during construction could result in soil compaction or rutting that would alter water infiltration, hydrology, and potentially inhibiting germination of native seeds and the ability of plants to develop root systems. Additionally, discharges from stormwater, dewatering structures, or hydrostatic testing could transport sediments and pollutants into wetlands, affecting water quality.

The impact of the project on PEM wetlands would be relatively brief because the emergent vegetation would regenerate quickly, typically within 1 to 3 years. Following revegetation, permanent impacts on PEM wetlands within the right-of-way would be minimal because these areas consist of and would remain as open and herbaceous communities. The duration of the impact on PSS and PFO wetlands would be longer term or permanent. Woody vegetation may take several years for recruitment and maturation, and would be precluded within a 10-foot-wide corridor centered over the pipeline, which would be permanently converted to PEM wetlands. In addition, select tree clearing may occur within 15 feet of the pipeline. As a result, 0.1 acre of PFO wetlands and 0.1 acre of PSS wetlands would be permanently converted to non-forested wetlands during operation of the project. The conversion from one vegetation cover type to another could result in changes in wetland functions and values. In general, however, it is expected that the affected wetlands would continue to provide important ecological functions such as sediment/toxicant retention, nutrient removal and transformation, flood attenuation, groundwater recharge/discharge, and wildlife habitat. The PFO and PSS wetlands within temporary construction work areas would be allowed to revert to preconstruction conditions following construction; however, due to the time required for these wetlands to regenerate, impacts would be considered long term.

In the draft EIS, we recommended that Midship Pipeline evaluate the feasibility of using alternative construction techniques (e.g., reduced right-of-way width, HDD, site-specific wetland restoration plan) to reduce impacts on the 6.6-acre PFO/PEM wetland complex associated with Oil Creek between Mainline MPs 141.5 and 142.2. In response, Midship Pipeline instead incorporated a reroute to completely avoid the PFO/PEM wetland complex.

Midship Pipeline proposes to use the HDD method to install the mainline beneath three wetlands. One wetland is within the area associated with installation of the pipeline beneath Interstate 40, near Mainline MP 15.6; the second is a PFO wetland associated with an unnamed tributary to Wildhorse Creek

at MP VE9.5 of the Velma Lateral; and the third is a PSS wetland associated with unnamed tributaries to Wildhorse Creek and the Highway 76 crossing at MP VE11.4 of the Velma Lateral. Use of the HDD method would reduce mechanical clearing, and eliminate the need for trenching and operating heavy construction equipment within these wetlands. Midship Pipeline would conduct limited hand clearing at this location to create a footpath for personnel to lay an HDD guide wire between the entry and exit points.

To minimize impacts on wetlands, Midship Pipeline would implement specialized wetland construction procedures within wetlands as described in the Procedures. These wetland protection measures include, but are not limited to:

- limiting the construction right-of-way width to 75 feet, except in areas where site-specific conditions require additional space and FERC approval has been granted;
- locating extra workspaces at least 50 feet from wetland boundaries, except at four locations where site-specific conditions warrant otherwise and our review has deemed Midship Pipeline's justifications acceptable;
- using low ground pressure equipment or equipment/timber mats to prevent rutting or soil mixing;
- cutting vegetation just above ground level, leaving existing root systems in place, and limiting the pulling of stumps and grading activities to directly over the trenchline except where the Chief Inspector and EI determine that these activities are required for safety reasons;
- installing sediment barriers immediately after initial ground disturbance at the edge of the boundary between wetlands and uplands, immediately upslope of the wetland boundary, and along the edge of the right-of-way as necessary to contain spoil and to protect adjacent wetland areas;
- restoring preconstruction contours to maintain the original wetland hydrology; and
- prohibiting the use of herbicides or pesticides within 100 feet of wetlands or waterbodies except as specified by the appropriate land management or state agency.

Following construction, Midship Pipeline would ensure that all disturbed wetland areas are successfully revegetated. Along with any additional agency permit requirements, revegetation would not be considered successful until:

- the affected wetland satisfies the current federal definition for a wetland;
- vegetation is at least 80 percent of either the cover documented for the wetland prior to construction, or at least 80 percent of the cover in adjacent wetland areas that were not disturbed by construction;
- the plant species composition is consistent with early successional wetland plant communities in the affected ecoregion; and

- invasive species and noxious weeds are absent, unless they are abundant in adjacent areas that were not disturbed by construction.

In accordance with the Procedures, Midship Pipeline would conduct routine wetland monitoring for a minimum of 3 years to assess the success of wetland revegetation. As applicable, specific monitoring requirements required by other permitting agencies would also be implemented. Three years after construction (or sooner if determined to be successful), Midship Pipeline would file a report with the Secretary identifying the status of wetland revegetation efforts and documenting success as defined above. Where revegetation is not successful at the end of 3 years, Midship Pipeline would develop and implement remedial revegetation plans, in consultation with a professional wetland ecologist, to actively revegetate any wetland and continue revegetation efforts and file annual reports until wetland revegetation is deemed successful.

4.4.5 Extra Workspaces Within 50 Feet of Wetlands

The FERC Procedures specify that all extra work areas should be set back at least 50 feet from wetlands. Midship Pipeline has proposed ATWS at three locations within 50 feet of a wetland boundary. Table 4.4.5-1 lists the locations where Midship Pipeline proposes less than a 50-foot setback from a wetland and the site-specific rationale for the requested modification from our Procedures. Based on our review, we have determined that Midship Pipeline has provided adequate justification for the requested ATWSs.

TABLE 4.4.5-1

Justification for Additional Temporary Workspace Within 50 Feet of Wetlands for the MIDSHIP Project

Facility [a]/Wetland I.D.	ATWS Milepost	Justification	FERC Comments
Mainline			
W-GR-WCR-16/12/13-03	74.3	The proposed ATWS would be needed for a staging area for parking and equipment for installing a point of inflection and foreign pipeline crossing.	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
AW-BR-NWI-PEM1F-195	195.6	The proposed ATWS would be needed to facilitate a stream crossing.	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
Velma Lateral			
W-ST-RKT-17/04/11-23	VE4.4	The proposed ATWS is in the most advantageous place for the stream and wetland crossing and is as far from the wetland as feasible. The ATWS is also needed for a road crossing.	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.

[a] There are no requested modifications for ATWS along the Chisholm Lateral.

4.4.6 Compensatory Mitigation

In accordance with the Procedures and the CWA Section 404(b)(1) Guidelines, Midship Pipeline would avoid wetlands along the proposed pipeline whenever possible. The COE has a goal of "no net loss" of wetlands in the United States. Where impacts on wetlands cannot be avoided, the COE requires

mitigation to replace the loss of wetland function. Unavoidable wetland impacts must be offset by the creation, restoration, enhancement, or preservation of at least an equal amount of wetlands, which is referred to as compensatory mitigation. There are three mechanisms for providing compensatory mitigation:

- permittee-responsible compensatory mitigation;
- mitigation banks; and
- in-lieu fee mitigation.

As discussed in section 4.4.4, construction and operation of the MIDSHIP Project would result in the permanent conversion of 0.1 acre of PFO wetlands and 0.1 acre of PSS wetlands to other wetland types. Therefore, as part of the section 404 CWA permitting process, Midship Pipeline could be required to develop a *Compensatory Mitigation Plan* to mitigate unavoidable wetland impacts. The *Compensatory Mitigation Plan* would be subject to review and approval by the District Engineer for the COE, Tulsa District. Midship Pipeline filed its Pre-construction Notification to the COE Tulsa District in May 2017, with updated information filed in March and April 2018.

4.4.7 Conclusion

While minor adverse and long-term effects on wetlands would occur, with adherence to FERC's Procedures, we conclude that construction and operation of the project would result in minor impacts on wetlands that would be appropriately mitigated and reduced to less than significant levels. In addition, the COE could require Midship Pipeline to offset unavoidable impacts on wetlands through the creation, restoration, enhancement, or preservation of at least an equal amount of wetlands through implementation of an agency-approved *Compensatory Mitigation Plan*.

4.5 VEGETATION

4.5.1 Existing Vegetation Conditions

Ecoregions are areas that have similar environmental resources and characteristics, including geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology (EPA, 2013). These characteristics provide a useful means for classifying and describing vegetation resources within the project area. Three distinct ecoregions are present along the proposed pipeline routes: the Central Great Plains, Cross Timbers, and South Central Plains Ecoregions (EPA, 2013).

The Chisholm Lateral and the northern end of the Mainline would be within the Central Great Plains Ecoregion. Historically, this ecoregion is a lower and wetter grassland with more scattered low trees and shrubs than the high plains to the west. Underground salt deposits have also created high salinity in some streams in the area. Much of the ecoregion is currently used as cropland.

The majority of the Mainline and the entire Velma Lateral are within the Cross Timbers Ecoregion. The ecoregion is composed mostly of little bluestem grassland with scattered blackjack oak and post oak trees, representing a transitional area between the plains and prairies to the west and the forested low mountains or hills of eastern Oklahoma and Texas. The region is less suitable for crop production than other nearby ecoregions (EPA, 2013).

The southern end of the Mainline would be within the South Central Plains Ecoregion. Locally termed as "piney woods," this region of mostly irregular plains represents the western edge of the southern coniferous forest belt. Once blanketed by a mix of pine and hardwood forests, much of the region is now

composed of loblolly pine and shortleaf pine plantations, although no pine plantations have been identified within the project area. Less than 20 percent of the region is cropland, which is primarily within the Red River floodplain, while the majority of the ecoregion is composed of forested vegetation communities (EPA, 2013). Impacts on agricultural land are further described in sections 4.8.1.2 and 4.8.4.

4.5.1.1 Pipeline Facilities

Vegetation community types along the proposed pipeline segments were classified based on a review of aerial photography, existing land use classifications, and documentation during field surveys. Industrial and commercial land represents about 4 percent of the proposed land that would be required for the project. Of the vegetated areas within the project footprint, the majority (about 85 percent) consists of open upland, followed by forested upland (about 15 percent); less than 1 percent of the project area is within wetland vegetation communities (see section 4.4.4). A summary of the vegetation types within the construction and operation workspace of the proposed project, including common species found within each type, is described below.

Open Uplands

The majority of land in this part of Oklahoma consists of open, herbaceous upland with smaller, interspersed areas of trees and woody vegetation generally within riparian drainageways. Along the proposed pipeline routes, the open land cover generally transitions from areas in heavy crop production and agricultural use in the north to more open grasslands and pasture in the south. Over half (54 percent) of the proposed pipeline segments are adjacent to existing pipeline and utility rights-of-way maintained in an open, herbaceous state. The open upland community type within the project workspace consists of a variety of herbaceous vegetative cover including:

- agricultural areas – communities with cropland and hayfields, including fields that are regularly cultivated and used to grow row crops;
- grassland – non-agricultural communities dominated by grasses native to the area;
- shrubland – communities dominated by shrub cover;
- pasture – communities consisting of grass and forb species intended to provide for grazing animals; and
- fallow fields – communities characterized as former cropland, abandoned agricultural land, fallow, and/or other disturbed areas that now are dominated by a mixture of mid-grass or short-grass species, introduced grass species, and annual weedy species.

Common grass species observed in the open, upland areas within the proposed project area included blue grama, buffalo grass, sideoats grama, little bluestem, big bluestem, switchgrass, and Indian. Forb species commonly found in the open uplands included annual ragweed, eastern prickly pear, and bush-clover. Common shrub species observed included chokecherry, American plum, sand plum, coralberry, roughleaf dogwood, ninebark, and sumac. Common crops observed in agricultural areas included winter wheat, corn, soybeans, sorghum, rye, oat, canola, and hay, comprised of grass, legumes, and or herbaceous plants.

Forested Uplands

Forested uplands crossed by the proposed routes are generally limited to riparian drainageways, where hydrology allows for the higher water demand of trees. Larger, denser forested areas are found at the southern end of the proposed Mainline. The portion of the proposed Mainline through Garvin and Carter Counties would cross multiple upland forested areas. The Mainline would also cross a large section of upland forest in Johnston County; this portion of the route would largely be collocated with existing utility rights-of-way. The typical upland forest vegetation community types along the proposed pipeline routes include: oak-hickory forest, oak-pine forest, post oak-blackjack oak forest, and bottomland/ floodplain forests.

Oak-hickory forest represents the western edge of the eastern deciduous forest in Oklahoma, and is dominated by oak and hickory tree species. Common taxa observed during survey include black, white oak, northern red oak, post oak, mockernut hickory, and bitternut hickory, along with small areas of shortleaf pine.

The oak-pine forest is similar to the oak-hickory forest, but is also dominated by shortleaf pine. In addition to the species characterizing the oak-hickory forest, blackjack oak, winged elm, water oak, willow oak, and blackgum are also present.

The post oak-blackjack oak forest is dominated by post oak and blackjack oak, and typically forms a mosaic with prairie vegetation.

The bottomland/floodplain forest is associated with gravel and sand bars and the lowest terrace of all river and creek systems. Species include plains cottonwood, narrowleaf cottonwood, willow, salt cedar, sycamore, green ash, white ash, American elm, and species of hackberry. Herbs, vines, and shrubs are typically abundant in the understory.

4.5.1.2 Aboveground Facilities, Access Roads, and Contractor Yards

Vegetation communities associated with the proposed aboveground facilities include open uplands (96 percent) and forested uplands (4 percent). Forested communities occur primarily within the Bennington Compressor Station site, although small forested areas are present within the Tatums Compressor Station site and Grady and Velma Meter Station sites. During project planning, Midship Pipeline sited aboveground facilities to avoid impacts on wetland communities.

To the extent feasible, existing public and private road crossings along the proposed pipeline segments would be used as the primary means of accessing rights-of-way. Midship Pipeline has identified a total of 116 temporary and permanent access roads for use during construction and operation of the project. Of the permanent and temporary access roads, 83 are existing roads that would require only minor modifications and 7 are existing roads that would require some new construction to extend their length. The remaining 26 access roads, including 17 of the permanent access roads, would be newly constructed.

Midship Pipeline has identified three proposed contractor yards for potential use during the construction of the project. All three proposed yards are in open uplands currently in agricultural use.

4.5.2 Vegetation Communities of Special Concern or Value

Midship Pipeline consulted with federal and state resource agencies to identify sensitive or protected vegetation types, natural areas, and unique plant communities in the project area. No vegetation communities of special concern or value were identified within the project area.

We received a scoping comment from a landowner in Grady County expressing concern about the impacts of the project on native bluestem grass within the proposed pipeline right-of-way on their property. As discussed in section 3.3, Midship Pipeline would restore the disturbed right-of-way to pre-existing conditions using a seed mix containing native bluestem and other species approved by the landowner.

4.5.3 Noxious Weeds, Invasive Plant Species, and Plant Disease Prevention

Invasive species are those that display rapid growth and spread, becoming established over large areas (USDA, 2017). Most commonly, they are exotic species that have been introduced from another part of the United States, another region, or another continent, although some native species that exhibit rapid growth and spread are also considered invasive. Invasive plant species can change or degrade natural vegetation communities, which can reduce the quality of habitat for wildlife and native plant species. Similar to invasive species, noxious weeds are frequently introduced but are occasionally native. Noxious weeds are defined as those that are injurious to commercial crops, livestock, or natural habitats and typically grow aggressively in the absence of natural controls (USDA, 2017). The Oklahoma Noxious Weeds Statute (Title 35, Chapter 30, Subchapter 34) lists musk thistle (*Carduus nutans*), scotch thistle (*Onopordum acanthium*), and Canada thistle (*Cirsium arvense*) as noxious weeds.

Midship Pipeline documented noxious weeds on accessible tracts during its field surveys in 2016 and 2017. Canadian thistle, musk thistle, and other thistle species have been identified in Canadian, Garvin, Carter, and Johnston Counties, primarily along roadsides and fence lines and in disturbed lands, such as grazed pastures and fallow fields.

4.5.4 General Impacts and Mitigation

Table 4.5.4-1 lists the amount of forested and open land vegetation cover types that would be affected by construction and operation of the proposed project. Construction of the project, including the construction right-of-way, ATWS, aboveground facilities, contractor yards, and access roads would affect 3,198.8 acres of vegetated lands. This would include 2,732.8 acres of open upland, 3.3 acres of open wetland (i.e., PEM and PSS wetlands), 462.4 acres of forested upland, and 0.2 acres of forested wetland. Following construction, vegetation in temporary construction areas would be allowed to revert to preconstruction vegetation conditions. Operation of the project, including routine mowing in the maintained pipeline rights-of-way, conversion of vegetation within the aboveground facility sites, and permanent access roads would affect 1,438.5 acres of vegetated land, including 1,243.5 acres of open upland, 2.2 acre of open wetland, 192.6 acres of forested upland, and 0.1 acre of forested wetland.

Construction impacts on vegetation resources are classified based on the duration and significance of impacts. Temporary impacts generally occur during construction with vegetation returning to preconstruction conditions almost immediately after construction. Short-term impacts are those that require up to 3 years to return to preconstruction conditions. Long-term impacts require more than 3 years to revegetate, but conditions would return to their preconstruction state during the life of the project. Permanent impacts are those that modify vegetation resources to the extent that they would not return to preconstruction conditions during the life of the project. See section 4.8 for additional information on land use impacts. Additional wetland impact information is provided in section 4.4.4.

TABLE 4.5.4-1

Acres of Vegetation Potentially Affected by the MIDSHIP Project[a]

Facility Type/Facility	Open Land [b]						Forested						Total	
	Upland		Wetland		Total		Upland		Wetland		Total			
	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.
PIPELINE FACILITIES														
Mainline	2,165.6	987.3	2.8	1.9	2,168.4	989.2	417.4	167.6	0.2	0.1	417.6	167.7	2,585.9	1,156.9
Chisholm Lateral	268.2	120.1	0.3	0.1	268.5	120.2	1.4	0.5	0.0	0.0	1.4	0.5	269.9	120.8
Velma Lateral	95.4	57.7	0.3	0.2	95.6	57.9	34.7	20.1	0.0	0.0	34.7	20.1	130.4	78.0
Tie-in Piping	1.0	0.7	0.0	0.0	1.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.7
PIPELINE FACILITIES TOTAL	**2,530.1**	**1,165.7**	**3.3**	**2.2**	**2,533.4**	**1,167.9**	**453.4**	**188.3**	**0.2**	**0.1**	**453.6**	**188.4**	**2,987.0**	**1,356.3**
ABOVEGROUND FACILITIES														
Calumet Compressor Station	32.5	16.4	0.0	0.0	32.5	16.4	0.0	0.0	0.0	0.0	0.0	0.0	32.5	16.4
Tatums Compressor Station	22.3	18.9	0.0	0.0	22.3	18.9	1.1	0.9	0.0	0.0	1.1	0.9	23.3	19.7
Bennington Compressor Station and NGPL Meter Station	31.3	19.4	0.0	0.0	22.3	19.4	3.1	2.6	0.0	0.0	3.1	2.6	34.4	21.9
Sholem Booster Station	6.6	6.6	0.0	0.0	6.6	6.6	0.0	0.0	0.0	0.0	0.0	0.0	6.6	6.6
Chisholm Meter Station	1.3	0.9	0.0	0.0	1.3	0.9	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.9
Okarche/Mark West Meter Stations	4.0	3.8	0.0	0.0	4.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	4.0	3.8
Canadian Valley Meter Station	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Cana Meter Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Iron Horse Meter Station	0.9	0.8	0.0	0.0	0.9	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.8
Grady Meter Station	2.0	1.6	0.0	0.0	2.0	1.6	0.1	0.1	0.0	0.0	0.1	0.1	2.1	1.7
Velma Meter Station	0.5	0.4	0.0	0.0	0.5	0.4	0.7	0.5	0.0	0.0	0.7	0.5	1.2	0.9
NGPL 801 Meter Station	2.4	1.9	0.0	0.0	2.4	1.9	0.0	0.0	0.0	0.0	0.0	0.0	2.4	1.9
Bennington Meter Station	3.7	3.7	0.0	0.0	3.7	3.7	0.0	0.0	0.0	0.0	0.0	0.0	3.7	3.7
Valves	0.7	0.7	0.0	0.0	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7
ABOVEGROUND FACILITIES TOTAL	**108.5**	**74.9**	**0.0**	**0.0**	**108.5**	**74.9**	**5.0**	**4.5**	**0.0**	**0.0**	**5.0**	**4.5**	**113.5**	**79.0**
YARDS AND ACCESS ROADS														
Access Roads	31.0	2.8	0.0	0.0	31.0	2.8	4.0	0.2	0.0	0.0	4.0	0.2	35.0	3.0
Contractor Yards	63.3	0.0	0.0	0.0	63.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.3	0.0
YARDS AND ACCESS ROADS TOTAL	**94.4**	**2.8**	**0.0**	**0.0**	**94.4**	**2.8**	**4.0**	**0.2**	**0.0**	**0.0**	**4.0**	**0.2**	**98.4**	**3.0**
PROJECT TOTAL	**2,732.8**	**1,243.5**	**3.3**	**2.2**	**2,736.2**	**1,245.7**	**462.4**	**192.6**	**0.2**	**0.1**	**462.6**	**192.7**	**3,198.8**	**1,438.5**

[a] The totals may not match the sum of addends due to rounding.
[b] Vegetation communities included in the Open Lands category include both the Agricultural and Open Land categories presented in table 4.8.1-1.

Pipeline Facilities

The extent of impacts on vegetation would vary depending on the type of vegetation affected and the area and frequency of vegetation maintenance conducting during operation. The primary effect of pipeline construction would be cutting, clearing, and/or removing 2,987.0 acres of existing vegetation, of which 453.4 acres would be forested uplands. The remaining vegetation would include 2,530.1 acres of open uplands and 3.5 acres of wetlands (including 0.2 acre of forested wetlands and 3.3 acres of non-forested wetlands). Secondary impacts associated with disturbances to vegetation could include increased soil compaction and erosion, increased soil temperature and dryness, increased potential for the introduction and establishment of non-native and invasive species, and physical damage to nearby trees. See section 4.4 for a discussion of mitigation measures for impacts on wetlands.

Clearing activities would include the removal of vegetation within the proposed construction workspace by mechanical or hand cutting methods. During clearing activities, Midship Pipeline would fell brush and trees into the construction area to minimize damage to trees and structures adjacent to the workspace, and would take care to avoid damaging adjacent tree limbs and feeder roots. Midship Pipeline would conduct selective side-trimming on trees adjacent to the construction area where necessary for safety. Stumps would be cut as low to the ground as possible. Stumps would be removed along the trench line, and selectively in other construction areas to allow for the safe installation of the pipeline.

As described above, the majority of vegetation affected by construction of the project would be open uplands, which would result in temporary to short-term impacts. Topsoil would be segregated during construction within cultivated or rotated agricultural lands, and at the landowner's request in other areas. Following pipeline installation, the topsoil would be returned in order to mitigate impacts on subsequent crop production. Lands currently dominated by herbaceous growth would revegetate quickly, often within one growing season after seeding and otherwise typically within 3 years. Most impacts on agricultural lands would be temporary to short-term because these areas are disturbed annually to produce crops and would typically return to their previous condition shortly following construction, cleanup, and restoration.

The proposed project crosses several large forested areas, which are primarily within Garvin, Stephens, Carter, and Johnston Counties. The pipeline routes would be collocated in many of these areas, thus reducing overall impacts on adjacent forested communities and forest fragmentation. However, several densely forested tracts near the border of Garvin and Carter Counties would be fragmented by construction of the MIDSHIP Project, as further discussed in section 4.6.1.2.

Construction in forested uplands would remove the tree canopy over the entire width of the construction right-of-way, which would change the structure and environment of the underlying and adjacent areas. Forested uplands within the maintained right-of-way would be permanently converted to an herbaceous cover type. The indirectly affected lands adjacent to the right-of-way would remain forested; however, they would have reduced habitat value compared to preconstruction conditions. The creation of edge habitat could increase the risk of invasive species and other impacts on wildlife species. The regrowth of shrubs and trees within the temporary workspaces would reduce the edge effect and provide connectivity between adjacent forested tracts to some extent (Tewksbury et al., 2002), but it may take decades before these areas resemble the forest vegetation that was present before construction, resulting in long-term impacts.

Soils that were previously shaded by the tree canopy would receive increased amounts of light, which could lead to drier soils and higher soil temperatures until vegetation returns. Trees on the edge of the right-of-way might be subject to mechanical damage and roots could be affected by soil disturbance and compaction, all of which could result in the decreased health and viability of some trees and root

systems. Some edge trees that were previously within dense forested stands may also lack stability following removal of adjacent supporting trees, which could result in increased susceptibility to wind damage.

Following construction, Midship Pipeline would seed the construction workspace and allow natural succession to revegetate workspaces disturbed by construction in accordance with the Plan and Procedures. Midship Pipeline would use and apply a seed mix that incorporates recommendations from the local soil conservation authority, the landowner, or land management agency, including:

- using a native seed mixture with specific varieties based on specific sites and area of adaptation;
- applying seed at suggested rates;
- seeding disturbed areas between December 1 and June 15, ideally during the spring months of March and April; and
- providing a temporary cover of grain crops or hay mulch when seeding cannot be implemented during the recommended months.

To control the spread of noxious weed species within the project area, Midship Pipeline has agreed to implementing the following measures:

- use seed products and mulch materials that are certified weed-free and do not contain state-listed invasive or noxious species;
- clean equipment (including construction machinery and vehicles) prior to entering the construction area and before moving onto new sites; and
- document any noxious weed populations observed prior to vegetation clearing and construction.

Once construction is complete, Midship Pipeline would monitor and control occurrences of noxious and invasive weed species in locations along the route where infestations were not identified prior to construction. Control measures for infestations would be determined in consultation with the NRCS and state agencies. These measures could include the use of non-persistent and biodegradable herbicides, applied by locally certified personnel.

In accordance with the FERC Plan, Midship Pipeline would conduct follow-up inspections of all disturbed areas to determine the success of revegetation. Revegetation in non-agricultural areas would be considered successful when the density and cover of non-nuisance vegetation are similar to adjacent, undisturbed lands. In agricultural areas, revegetation would be considered successful when, upon visual survey, crop growth and vigor are similar to adjacent undisturbed portions of the same field unless otherwise specified in the easement agreement. Midship Pipeline would file with the Secretary quarterly activity reports documenting the results of revegetation for at least 2 years following construction.

Routine vegetation mowing or clearing within the operational right-of-way would not be conducted more frequently than every 3 years. However, in accordance with the Plan, Midship Pipeline proposes to maintain an herbaceous corridor up to 10 feet wide centered on the pipeline to facilitate periodic corrosion/leak surveys.

Aboveground Facilities, Contractor Yards, and Access Roads

Construction of the proposed aboveground facilities would disturb about 113.5 acres of vegetation including 108.5 acres of open uplands and 5.0 acres of forested uplands. Following construction, 74.9 acres of open uplands and 4.1 acres of forested uplands would be permanently converted to developed land for operation of the aboveground facilities. The remaining 34.5 acres of construction workspace (including about 33.6 acres of open uplands and 0.9 acre of forested uplands) would be stabilized, seeded, and allowed to revegetate in accordance with the Plan. Revegetation within non-agricultural areas would be considered successful when the density and cover of non-nuisance vegetation are similar in density and cover to adjacent undisturbed lands.

Construction of the project access roads and contractor yards would disturb about 98.4 acres of vegetation. The open uplands affected during construction would be allowed to revert back to preconstruction conditions. The majority of the access roads are existing roads including paved roads and access ways, gravel roads, and unimproved dirt roads. Tree trimming would be selectively conducted along the existing access roads. Twenty-five access roads would be retained for operation of the project and would result in the permanent conversion of about 2.7 acres of vegetation, including 2.5 acres of open upland and 0.2 acre of forested upland.

4.5.5 Conclusion

Based on our review of the potential impacts on vegetation as described above, we conclude that the primary impact from construction and operation of the project would be on forested lands. However, the eventual regrowth of prior forested areas outside of the permanent right-of-way, and collocation with existing, maintained rights-of-way through the majority of large forested areas crossed by the proposed pipeline routes, we conclude that impacts on vegetation, including forested areas, would be adequately reduced to less than significant levels. In addition, impacts on forested and non-forested vegetation types, as well as the introduction or spread of noxious weeds or invasive plant species, would be further mitigated through adherence to the measures outlined in the Plan and Procedures, migratory bird provisions (outlined in section 4.7.2), Midship Pipeline's forthcoming *Compensatory Mitigation Plan* for wetlands, and other mitigation measures described above.

4.6 WILDLIFE AND AQUATIC RESOURCES

4.6.1 Existing Wildlife Resources

The MIDSHIP Project would cross habitats that support a variety of wildlife species. Vegetation cover type, species composition, and density are important environmental factors influencing wildlife habitat and species distribution. Detailed information on vegetation types present in the project area is provided in section 4.5. The dominant wildlife habitat types that have been identified in the project area include: forested uplands, open uplands, agricultural land, and wetlands. Table 4.6.1-1 describes how each of these habitat types has been defined for the purposes of this discussion.

TABLE 4.6.1-1

Representative Species Within Vegetation Communities for the MIDSHIP Project

Land Cover Type	Vegetation Community/ Habitat Description	Representative Species
Forested upland	Non-wetland forested and woodland communities supporting a dominance of tree cover	Black bear, white-tailed deer, white-footed mouse, Virginia opossum, eastern gray squirrel, eastern chipmunk, raccoon, coyote, red fox, eastern cottontail, striped skunk, American woodcock, northern cardinal, cedar waxwing, Cooper's hawk, red-headed woodpecker, broad-banded copperhead, gray tree frog, ornate box turtle, and timber rattlesnake
Open upland	Non-wetland native grasslands, unimproved pastures, and maintained utility rights-of-way that support a dominance of grass species	American badger, black-tailed prairie dog, coyote, eastern chipmunk, eastern cottontail, Virginia opossum, raccoon, red fox, striped skunk, white-tailed deer, cottontail rabbit, American woodcock, bobwhite quail, northern cardinal, Cooper's hawk, eastern meadowlark, European starling, horned lark, mourning dove, wild turkey, and ornate box turtle
Agricultural land	Plowed ground where crops are planted and harvested; improved pastures	Coyote, eastern cottontail, Virginia opossum, raccoon, red fox, striped skunk, white-tailed deer, bobwhite quail, Cooper's hawk, eastern meadowlark, European starling, horned lark, mourning dove, and wild turkey
Wetlands	Palustrine emergent, scrub-shrub, and forested wetland communities	North American beaver, Virginia opossum, raccoon, white-tailed deer, great blue heron, alligator snapping turtle, broad-banded copperhead, common snapping turtle, eastern river cooter, gray tree frog, Mississippi mud turtle, and razor-racked musk turtle
Open water	Perennial, intermittent, and ephemeral waterbodies, as well as ponds	Mallard, American wigeon, wood duck, American coot, common goldeneye, green-winged teal, American woodcock, Canada goose, great blue heron, white pelican, North American beaver, otter, nutria, ornate box turtle, and snakes

Source: ODWC), 2016a, 2017a, 2017c

Of the wildlife habitats present within the project footprint, the majority consists of open upland (about 85 percent) and forested upland (about 15 percent); less than 1 percent of the project area is within wetland and open water communities. The greatest wildlife diversity and density is in natural habitats such as extensive areas of contiguous forest and open lands, which are described in additional detail in section 4.5.1. Habitats in agricultural lands such as pastures, croplands, and hayfields harbor generalist wildlife species, consisting primarily of small mammals and white-tailed deer. Representative wildlife species that utilize habitats within the project area are described in table 4.6.1-1. Wetland and open water habitats within the project area are discussed in additional detail in sections 4.4.1 and 4.3.2.1, respectively. Special status species, such as federally and state-listed threatened or endangered species, are discussed in section 4.7.

Some of the habitats within the project area support populations of big game, small game, and waterfowl. Big game species include black bear, white-tailed deer, and wild turkey; small game species include furbearers such as squirrels and rabbits. Migratory waterfowl such as mallard, wood duck, and American coot are also found in the project area. Game species are hunted or trapped, and also provide recreational value for wildlife observers throughout the year (Oklahoma Department of Wildlife Conservation [ODWC], 2017a).

4.6.1.1 Significant or Sensitive Wildlife Habitats

Significant and sensitive wildlife habitat includes state or federal lands managed to support populations of wildlife, areas designated by conservation organizations as providing unique or rare habitat for wildlife species, and other areas identified through coordination with state and federal resource agencies.

The proposed Mainline would cross the Blue River at MP 174.0, which is included on the NRI due to its location along the migration route of the federally endangered whooping crane (NPS, 2017b). Additional information on the whooping crane is provided in section 4.7.1.5. In addition, the proposed Mainline would cross the Canadian River at MP 28.4; at this location, the Canadian River and the 300-foot-wide riparian buffer on either side of the river are designated critical habitat for the Arkansas River shiner. Additional information on the Arkansas River shiner is provided in section 4.7.1.6.

Two other areas in the vicinity of the project area are considered significant wildlife habitats: the Tishomingo National Wildlife Refuge (NWR), which is about 1.0 mile south of the proposed Mainline at MP 161.4; and the Texoma/Washita Arm of the Tishomingo Wildlife Management Area (WMA), which is about 0.2 mile south of the Mainline at MP 146.0.

Tishomingo National Wildlife Refuge

The Tishomingo NWR is situated at the confluence of the Washita River and Pennington Creek, where both waterbodies form the Cumberland Pool, part of the larger Lake Texoma system of waterbodies. The refuge was established in 1946 to benefit migratory waterfowl in the Central Flyway; however, the Cumberland Pool and surrounding wetlands provide important habitat for both non-migratory and migratory bird species (FWS, 2017a). Wild plum thickets and oak-hickory-elm woodlands also provide upland habitat to wildlife typical of the region such as white-tailed deer (FWS, 2017a). Consultations between Midship Pipeline and the FWS are ongoing regarding avoidance or mitigation measures to reduce potential impacts on the Tishomingo NWR. However, because the MIDSHIP Project would not cross the Tishomingo NWR and the route would be largely collocated with an existing pipeline system, we conclude that no direct impacts on the refuge would occur and fragmention of habitat near the refuge would be adequately minimized. Indirect impacts (e.g., dust, noise) would be temporary, minor, and adequately minimized through implementation of mitigation measures found in the Plan and Procedures.

Texoma/Washita Arm of the Tishomingo Wildlife Management Area

The Texoma/Washita Arm of the Tishomingo WMA includes over 13,000 acres of land and lies along the Washita River and secondary drainages between the towns of Mannsville and Tishomingo in southern Johnston County. Oxbows and floodplain areas within the WMA provide a large amount of wetland habitat. Management efforts in the WMA focus on extensive agricultural plantings, most of which are administered through agricultural leases. In addition, some small wildlife plots are planted annually. Game species within the WMA include whitetail deer, rabbits, coyote, bobcat, raccoon, and wild turkey; however, the WMA is best known for waterfowl hunting opportunities (ODWC, 2017a; Fuller, 2004). No agricultural land would be permanently removed from production within 75 miles of the WMA. Consultations between Midship Pipeline and the ODWC are complete. However, if the project is approved, Midship Pipeline would alert the ODWC of construction schedules so that rangers could be made aware. Because the MIDSHIP Project would not cross the Texoma/Washita Arm of the Tishomingo WMA, we conclude that no direct impacts on the WMA would occur. Indirect impacts (e.g., dust, noise) would be temporary, minor, and adequately minimized through implementation of mitigation measures found in the Plan and Procedures.

4.6.1.2 General Impacts and Mitigation for Wildlife

About 3,205.6 acres of wildlife habitat would be affected by construction of the MIDSHIP Project, including open upland (2,732.8 acres), forested upland (462.4 acres), open water (6.8 acres), and wetlands (3.5 acres).

Pipeline Facilities

Construction of the pipeline facilities would result in both temporary and permanent impacts on wildlife and wildlife habitat. Construction would affect about 2,993.8 acres of wildlife habitat, including 2,530.1 acres of open uplands, 453.4 acres of forested upland, 3.5 acres of wetland habitat, and 6.8 acres of open water habitat (see sections 4.5.4 and 4.8.1). Following construction, Midship Pipeline would restore disturbed areas to preconstruction conditions in accordance with the FERC Plan and Procedures; about 1,356.3 acres of vegetated habitat within the permanent pipeline easements would be maintained in an herbaceous or early successional stage by periodic mowing of the right-of-way. This maintenance would result in the permanent conversion of about 188.3 acres of upland forest and 0.1 acres of forested wetlands to herbaceous and scrub-shrub habitat.

Impacts on wildlife from construction of the pipeline facilities could include displacement, stress, and direct mortality of some individuals. Vegetation clearing would reduce suitable cover, nesting, and foraging habitat for some wildlife species. Highly mobile wildlife, such as birds and mammals, may relocate to similar habitats nearby when construction activities commence. However, smaller, less mobile wildlife (e.g., reptiles, amphibians) could be inadvertently injured or killed by construction equipment. Typically, most construction equipment operates at slow speeds within the right-of-way and along access roads to avoid wildlife mortality, which reduces the potential for significant direct mortality of wildlife to occur as a result of construction activities. The influx of individuals to other nearby areas may increase population densities for certain species, resulting in increased inter- and intra-species competition and reduced reproductive success of individuals.

The duration of impacts on terrestrial wildlife habitat would depend on the rate at which vegetation regenerates after construction. Due to the length of time required for forested habitat to return to preconstruction conditions (from several years to decades), the greatest impacts on terrestrial wildlife are expected to result from clearing forested habitats. The proposed project crosses several large forested areas, which are primarily within Garvin, Stephens, Carter, and Johnston Counties; these areas would be converted to successional stages of open herbaceous and scrub-shrub habitat either permanently (on the permanent right-of-way) or until a mature forest community redevelops within temporary workspaces. Some wildlife species that rely on forested habitat for foraging, breeding, and nesting could be negatively affected by the long-term loss of forest cover. The pipeline routes would be collocated through the majority of the forested areas, reducing overall impacts on adjacent forested communities and forest fragmentation. However, several large forested tracts, totaling about 2.0 miles in length (about 24.0 acres), are interspersed with other habitat types near the border of Garvin and Carter Counties. These forested tracts would be fragmented by construction of the MIDSHIP Project, which would reduce the amount of interior habitat for forest-dwelling species. However, a review of aerial photography indicates that avoidance of forested habitat through this area would not be practicable due to engineering and environmental constraints. With habitat conversion and forest fragmentation, there is also a risk of intrusion by invasive or noxious species.

The duration of effects on wildlife using non-forested habitats such as agricultural lands, open uplands (including existing rights-of-way), non-forested wetlands, and open water would be shorter than in forested areas. Open uplands and non-forested wetland habitats would generally revegetate within a few years after construction is completed. Species that prefer open upland habitat would benefit from the conversion of forested lands to open lands. Agricultural lands would be available for replanting during the growing season immediately following construction. Because wildlife use of agricultural lands is typically limited to foraging activities, and the impacts from construction and operation of the pipelines on wildlife would be short-term in duration, impacts on wildlife would be minimal. Open water habitats would revert to preconstruction conditions shortly after the completion of in-water work (see section 4.6.2.2 for further discussion of impacts on aquatic resources). Overall, wildlife would quickly return to the project area, using the permanent easements as corridors for travel, refuge, foraging, and nesting.

Noise and ground disturbance generated by pipeline construction activities may temporarily affect wildlife behavior in the immediate vicinity. Noise would potentially cause wildlife to disperse to other neighboring habitats; however, the stresses associated with wildlife dispersal are not anticipated to result in any measureable effects on any species at the individual or population level.

Operational impacts on wildlife would be limited to minor maintenance and vegetation clearing operations. Routine vegetation mowing or clearing within the operational right-of-way would not be conducted more frequently than every 3 years. However, in accordance with the Plan, Midship Pipeline proposes to maintain an herbaceous corridor up to 10 feet wide centered on the pipeline to facilitate periodic corrosion/leak surveys. Infrequent noise would be generated during operational monitoring and maintenance activities, such as vegetation clearing or during ground or air surveillance of the pipeline. However, these impacts would be expected to be minor and temporary given the mobile nature of most wildlife in the area.

Aboveground Facilities

Construction of the proposed aboveground facilities would affect a total of about 113.5 acres of vegetated wildlife habitat, including the permanent conversion of 79.0 acres (74.9 acres of open upland and 4.5 acres of forested upland) to industrial use for facility operation. The majority of these impacts would be associated with construction of the three proposed compressor stations. No open water habitat would be affected by construction or operation of the proposed aboveground facilities.

Wildlife would be permanently displaced from each of the aboveground facility sites due to the conversion of vegetated habitat to non-vegetated and/or impervious cover, and due to the erection of security fencing at the new aboveground facility sites. During facility operations, security fencing would be expected to limit the use of any vegetated habitat within the aboveground facility sites by larger wildlife species, particularly mammals. In addition, increased noise levels in the vicinity of the compressor stations may result in avoidance of the area by wildlife until they become acclimated to the noise increase. Increases in ambient lighting may result in a decrease in wildlife use of adjacent habitat. However, given the amount of suitable habitat present within adjacent areas, we conclude these effects would be negligible.

Contractor Yards

The three proposed contractor yards would temporarily affect 63.3 acres of open upland habitat for terrestrial wildlife. Following construction, the yards would be seeded if necessary and allowed to revert to preconstruction conditions. The majority of impacts on wildlife would be temporary and short-term, similar to those discussed above for the proposed pipeline facilities.

4.6.1.3 Conclusion

Overall, we conclude that wildlife resources would not be significantly affected due to construction and operation of the project based on the presence of suitable adjacent habitat available for use, the temporary nature of pipeline construction, the relatively low amount of habitat converted to developed land, and the implementation of measures in our Plan and Procedures and Midship Pipeline's SPRP to reduce or avoid impacts.

4.6.2 Existing Aquatic Resources

A total of 407 waterbody crossings would be required for the MIDSHIP Project, which includes 58 perennial waterbodies, 121 intermittent waterbodies, 213 ephemeral waterbodies, and 15 ponds. A more

detailed characterization of the waterbodies that Midship Pipeline would cross is provided in section 4.3.2. None of the aboveground facilities or contractor yards would directly affect aquatic resources.

As described in additional detail in section 4.3.2.3, the OWRB has established water quality standards consisting of three main components, including the designation of beneficial uses, criteria to protect the designated uses, and antidegradation policies (OWRB, 2017a). Fish and wildlife propagation is one of the currently recognized beneficial use water quality classifications (Oklahoma Statutes 785:45-5-12). Fish and wildlife propagation includes four subcategories that are based on the ability of a waterbody to sustain different climax communities of fish and shellfish: habitat limited aquatic community, warm water aquatic community, cool water aquatic community, and trout fishery. With the exception of Pennington Creek (Mainline MP 154.1), which has been designated as a cool water fishery, waterbodies crossed by the project are considered warm water fisheries and are not designated for fish and wildlife propagation by the OWRB.

Several waterbodies that would be crossed by the project provide recreational fishing opportunities, a popular activity within Oklahoma. The North Canadian and Canadian Rivers support several recreational fishery species, including various species of gar and flathead chub. The Blue River and Pennington Creek provide fishing opportunities for rainbow trout. Wildhorse Creek also provides recreational fishing for largemouth bass, channel catfish, and brown trout.

4.6.2.1 Fisheries of Special Concern

Midship Pipeline coordinated with the FWS and the ONHI to identify proposed waterbody crossings that may contain federally or state-listed species and designated critical habitat. One of these waterbodies, the Canadian River (MP 28.4), is within critical habitat for the Arkansas River shiner, and supports populations of the threatened species. Additional information regarding the Arkansas River shiner is provided in section 4.7.

Coordination with the FWS also identified one waterbody that supports a fishery of special concern. The least darter is known to occur within the Blue River, which would be crossed by the Mainline at MP 174.0. The least darter is primarily found in the Great Lakes states; the Blue River watershed is the southernmost portion of the species' range. This species occurs within clear, cool water in spring-fed streams with soft substrates and dense vegetation (OWRB, 2008). Coordination with the FWS (FWS, 2017b) indicates that the least darter population within the Blue River is experiencing a decline. The proposed pipeline would be installed beneath the Blue River using the HDD method, thus avoiding direct impacts on the least darter, as discussed below.

There is no federally designated essential fish habitat in the project area.

4.6.2.2 General Impacts and Mitigation

This section describes general impacts on aquatic resources and the measures Midship Pipeline would implement to minimize these impacts. Appendix J provides the unique identification number, waterbody name, milepost, crossing width, fishery type, water quality classification(s), and proposed crossing method for each waterbody. The HDD method would be used to cross 17 waterbodies, avoiding in-stream activity and disturbance. Midship Pipeline has proposed to construct across the remaining waterbodies using the wet open-cut method or by utilizing one of two dry crossing methods. See sections 4.3.2.5 and 4.3.2.6 for additional information regarding construction methods and impacts on waterbodies. Potential impacts on federally listed species and their designated critical habitat are provided in section 4.7.1.

Wet Open-Cut Crossings

Midship Pipeline proposes to use the wet open-cut method to cross 301 waterbodies. Of those 301 waterbodies, 13 are perennial and therefore would be most likely to contain fish species and aquatic resources. Construction activities associated with the wet open-cut method that could potentially affect aquatic resources include clearing and grading of streambanks, in-stream trenching, blasting, trench dewatering, and potential spills or leaks of hazardous materials.

Increased sedimentation and turbidity resulting from in-stream and adjacent construction activities could displace and impact fisheries and aquatic resources. Sedimentation could smother fish eggs and other benthic biota and alter stream bottom characteristics, such as converting sand, gravel, or rock substrate to silt or mud. These habitat alterations could reduce juvenile fish survival, spawning habitat, and benthic community diversity and health. Increased turbidity could also temporarily reduce dissolved oxygen levels in the water column and reduce respiratory functions. Turbid conditions could also reduce the ability for aquatic species to find food sources or avoid predators. The extent of impacts from sedimentation and turbidity would depend on sediment loads, stream flows, stream bank and stream bed composition, sediment particle size, and the duration of the disturbances.

Generally, the wet open-cut crossing method is the fastest way to install a pipeline beneath a waterbody, which allows for some impacts to be very short in duration. In accordance with the Procedures, in-stream construction activities associated with crossing minor and intermediate waterbodies would be completed within 24 and 48 hours, respectively. After in-stream construction is complete, waterbody banks would be stabilized and temporary sediment barriers would be installed within 24 hours. In addition, Midship Pipeline would conduct crossings as close to perpendicular to the axis of the waterbody channel as engineering and routing conditions permit. Increased sedimentation and turbidity from wet open-cut crossings would be temporary and limited to the crossing location and areas immediately downstream. Impacts would normally be limited to a few days, depending on conditions at the crossing, the type and amount of suspended sediment, and other factors.

Stream bank vegetation, large woody debris, rocks, and undercut banks comprise riparian habitat. Riparian habitat provides valuable structure and opportunities for fish and stream biota. Open-cut crossings would temporarily remove this habitat and could reduce availability of habitat for fishery resources by reducing shade for the waterbody, diminishing escape cover, and potentially elevating local water temperatures and reducing levels of dissolved oxygen. Clearing, grading, and trenching activities in uplands or wetlands adjacent to waterbodies could temporarily alter surface drainage patterns and hydrology, and thus increase the potential for the trench to act as a drainage channel and reduce the capacity to control erosion and flooding. Prior to and during construction, Midship Pipeline would install sedimentation control devices to minimize and route any silt laden flow to well-vegetated areas or straw bale/silt fence structures. With the exception of the specific sites listed in section 4.3.2.6, extra workspaces would be a minimum of 50 feet from waterbodies. In accordance with the Procedures, when the pipeline route parallels a waterbody, Midship Pipeline would maintain at least 15 feet of undisturbed vegetation between the waterbody (and any adjacent wetland) and the construction right-of-way to minimize potential habitat impacts from erosion or runoff. Following construction, Midship Pipeline would be required to revegetate riparian areas with native species of conservation grasses, legumes, and woody species, similar in density to adjacent undisturbed land, in accordance with the Procedures. In addition, Midship Pipeline would conduct post-construction vegetation maintenance in accordance with the Plan and Procedures.

Dry Crossing Methods

Midship Pipeline proposes to use the dry crossing method (such as dam-and-pump or flume crossings) at 43 waterbody crossings, including perennial waterbodies that are intermediate in width and at

all but one waterbody designated as impaired. Dry crossing methods may also be used at additional crossings if field conditions allow at the time of construction. The use of dry crossing methods would have some of the same effects as an open-cut wet trench crossing (e.g., the clearing of vegetation and the disturbance of the stream bed and banks) but the potential for sedimentation and associated turbidity impacts is typically lower because the grading, trenching, and backfilling activities are isolated from the stream flow. The potential for sedimentation and turbidity would be limited to short periods of time during and shortly following the installation and removal of the dams and any flumes. If the dam-and-pump method is used, fish and other biota could also be impinged or entrained during pump use; however, Midship Pipeline would screen the intakes of its pumps to minimize the potential for this impact. In addition, Midship Pipeline would adhere to any applicable best management practices listed above for wet open-cut crossings.

HDD Crossings

As described in section 2.3.2, Midship Pipeline proposes to use the trenchless HDD method to install the pipeline beneath 17 waterbodies, including both waterbodies where fisheries of special concern are present. The use of the HDD method allows the pipeline to be installed far beneath the bed of a waterbody without directly affecting aquatic resources. The greatest potential for effects on aquatic resources associated with an HDD crossing would be an inadvertent release of drilling fluid into the waterbody either as a result of a direct discharge, or an indirect discharge resulting from the runoff of drilling fluid from an onshore inadvertent release. Any HDD drilling fluid that reaches a waterbody could increase the turbidity of the waterbody due to the high clay content of the water-based drilling fluid. Because the clay would remain in suspension for an extended period, the turbidity plume could persist for several minutes or hours and, depending on the flow of the waterbody, this turbidity plume could extend downstream for a considerable distance. The effect of the turbidity would be similar to the sedimentation effects described above for the wet open-cut method, but generally of smaller volume. To prevent and control inadvertent releases of drilling fluids, Midship Pipeline would implement its HDD Plan, which is provided in appendix F. This plan would include measures to monitor the drilling operation and drill path to identify and minimize the potential for inadvertent returns, minimize the duration of any releases that occur, and contain and clean up any spills. We have reviewed this plan and find it acceptable. As such, we expect the project would not significantly affect aquatic resources within waterbodies crossed using the HDD method.

Blasting

As noted in section 4.3.2.5, three intermittent waterbodies along the proposed Mainline contain shallow bedrock and may require blasting during construction. In-stream blasting has the potential to injure or kill aquatic organisms, displace organisms during blast-hole drilling activities, and temporarily increase stream turbidity. Chemical by-products from the blasting materials could also be released and could potentially contaminate the water. Midship Pipeline would select the type of explosive and size of charges, as well as determine the sequence of firing to minimize shock wave stresses on aquatic life. In addition, bubble curtains (caissons full of bubbles) may be used to avoid or reduce impacts on nearby aquatic resources. Additional details of how blasting would be conducted and measures to avoid and minimize effects related to blasting are included in the project-specific *Blasting Plan*, included in appendix I. We have reviewed this plan and find it acceptable. Midship Pipeline would also require its construction contractor to develop site-specific blasting plans for each waterbody crossing where blasting is determined to be necessary (see section 4.1.6 for additional information about blasting) and would obtain blasting permits from appropriate agencies. Given the limited use of blasting, that waterbodies where blasting may be required are intermittent or ephemeral, and with the implementation of the measures described above, we conclude that blasting, if required, would not result in significant impacts on aquatic resources.

Surface Water Appropriation and Discharges

Before placing the pipeline in service, Midship Pipeline would verify the structural integrity of the pipeline and aboveground facilities by conducting hydrostatic testing. In addition, water would be appropriated from waterbodies along the routes for dust suppression and for pipeline installation using the HDD method, which requires water to create the drilling mud used to lubricate the drill bit, remove drill cuttings, and hold the hole open (see additional discussion in section 4.3.2.5). In accordance with the Procedures, surface water would be drawn through a screened intake to prevent entrainment of fish and other aquatic organisms, and adequate flow rates maintained for the protection of downstream aquatic resources. Midship Pipeline does not propose to withdraw water from any waterbodies with special designations.

Upon completion of the hydrostatic test, the water would either be pumped to the next segment for testing or discharged at a rate of 1,500 gallons per minute through an energy-dissipating device and in compliance with NPDES permit conditions. Water would be discharged to an upland site near the original withdrawal location and not directly into a waterbody. Test water would contact only new pipe, and no chemicals would be added. As such, we conclude that the project would have no adverse impacts on aquatic resources.

Spill Prevention and Containment Measures

Accidental spills of hazardous fluids (e.g., oil, gasoline, hydraulic fluids) into waterbodies could result in reduced water quality that affects fish and other aquatic organisms. The potential impact would depend on the type and quantity of the spill, and the dispersal and attenuation characteristics of the waterbody. Minimization and mitigation measures related to water quality are described in section 4.3.2.6.

Midship Pipeline has developed a project-specific SPRP, which contains measures to prevent potential spills, and measures to be implemented to minimize impacts due to spills and leaks. These measures include conducting routine inspections of construction equipment, tanks, and storage containers to help reduce the potential for spills or leaks; restricting refueling and the handling of hazardous materials to greater than 100 feet from wetland and waterbody resources; and the use of secondary containment around all containers and tanks. With adherence to these measures, effects on aquatic resources from potential spills would be adequately minimized.

4.6.2.3 Conclusion

Based on our review of potential project effects on aquatic resources as described above, we conclude that the project would result in some temporary effects on aquatic resources, but these effects would be minimized or adequately reduced to less than significant levels through use of the HDD method, adherence to the measures outlined in the Plan and Procedures, implementation of Midship Pipeline's project-specific HDD Plan and SPRP.

4.7 THREATENED, ENDANGERED, AND OTHER SPECIAL STATUS SPECIES

Special status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed and federally proposed species that are protected under the ESA, as amended; species that are currently candidates for federal listing under the ESA; state-listed threatened or endangered species; and species otherwise granted special status at the state or federal level (e.g., species protected under the MBTA and the Bald and Golden Eagle Protection Act).

4.7.1 Federally Listed Species

Section 7 of the ESA requires federal agencies to ensure that any actions authorized, funded, or carried out by the agencies do not jeopardize the continued existence of a federally listed threatened or endangered species, or result in the destruction or adverse modification of designated critical habitat for a federally listed species. As the lead federal agency, FERC is required to consult with the FWS and/or National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) to determine whether federally listed endangered or threatened species or designated critical habitat occur in the vicinity of a proposed project, and to determine the potential effects of a project on these species or their critical habitats. The FWS, which is responsible for terrestrial and freshwater species, and NOAA Fisheries, which is responsible for marine and anadromous species, jointly administer the law.

For actions involving major construction activities with the potential to affect listed species or designated critical habitat, FERC must report its findings to the FWS and/or NOAA Fisheries in a Biological Assessment for those species that may be affected. If it is determined the action is likely to adversely affect listed species or designated critical habitat, FERC is required to initiate formal consultation with the appropriate agency. In response, the agency would issue a Biological Opinion as to whether or not the action would likely jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. The BA and BO processes are often used to confer on proposed and candidate species, as well as proposed critical habitat, due to the potential for these species to be listed in the future. Because there are no marine or anadromous habitats within the project area, consultation with NOAA Fisheries is not required for the MIDSHIP Project.

To assist in compliance with section 7 of the ESA, Midship Pipeline, acting as FERC's non-federal representative for the MIDSHIP Project, initiated coordination with the FWS regarding federally listed threatened or endangered species or designated critical habitat potentially occurring in or near the project area. Midship Pipeline's communications with the FWS are summarized in its *U.S. Fish and Wildlife Service Coordination Report (Revised)*, which was provided in Midship Pipeline's application as appendix 3B to Resource Report 3 and subsequently updated in September 2017.[8] Additional communications between Midship Pipeline and the FWS that occurred after September 2017 are documented in appendix 1G of Midship Pipeline's April 27, 2018 supplemental filing.[9]

Based on our review of publicly available information, agency correspondence, and field surveys, seven federally listed threatened or endangered species may occur or could potentially be affected by the project. Critical habitat has been designated for one species, the Arkansas River shiner, within the project area. These species are described in table 4.7.1-1, including habitat descriptions and our determination of effect for each. No candidate species or species proposed for federal listing, or critical habitats proposed for federal listing occur in the project area.

[8] An electronic version of the *U.S. Fish and Wildlife Service Coordination Report (Revised)* is available for download on the FERC website under Docket No. CP17-458-000 at https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20170906-5005

[9] Appendix 1G of Midship Pipeline's April 27, 2018 supplemental filing is available for download on the FERC website under Docket No. CP17-458-000 at https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20180427-5181

TABLE 4.7.1-1

Federally Listed Species Potentially Occurring Within the Vicinity of the MIDSHIP Project

Common Name *(Scientific Name)*	Federal Status	Counties Where Species May Occur	*Determination of Effect* and Habitat Assessment
Birds			
Black-capped Vireo (*Vireo atricapilla*)	Endangered [a, b]	Canadian	*Not Likely to Adversely Affect* This species' breeding range includes south central Oklahoma and extends south into Mexico. Breeding habitat is categorized as shrublands and open woodlands at least 3.7 acres in size. One area of potentially suitable habitat for this species is present within the portion of the project in Canadian County; however, the proposed pipeline would be installed through this area using the HDD method. Therefore, impacts on the black-capped vireo are not anticipated.
Least Tern (*Sterna antillarum*)	Endangered [a]	Bryan, Canadian, Carter, Garvin, Grady, Johnston, Kingfisher, and Stephens	*Not Likely to Adversely Affect* The least tern breeds along inland river systems in the United States and winters along the coasts of Central America and northern South America. Barren areas adjacent to waterbodies along the proposed pipeline routes could provide potentially suitable stopover or breeding habitat for this species. The proposed pipeline would be installed beneath the larger rivers that are more likely to provide suitable nesting habitat for the least tern using the HDD method. Therefore, impacts on the least tern are not anticipated.
Piping Plover (*Charadrius melodus*)	Threatened [a]	Bryan, Canadian, Carter, Garvin, Grady, Johnston, Kingfisher, and Stephens	*Not Likely to Adversely Affect* The species breeds in the northern United States and Canada and overwinters along the coast of the Gulf of Mexico. Occurrence within the project area would be limited to stopover habitat during migration. Although unlikely, it is possible that the project could result in avoidance of the area during construction activities.
Rufa Red Knot (*Calidris canutus rufa*)	Threatened [a]	Bryan, Canadian, Carter, Garvin, Grady, Johnston, Kingfisher, and Stephens	*No Effect* The species breeds in Alaska and Canada and overwinters in several regions, including the southeastern United States. Within the project area, occurrence would be limited to the migration season, where this species has been documented almost exclusively on man-made impoundments. Because the ponds along the proposed pipeline routes do not appear to be man-made, impacts on the rufa red knot are not anticipated.
Whooping Crane (*Grus americana*)	Endangered [a]	Bryan, Canadian, Carter, Garvin, Grady, Johnston, Kingfisher, and Stephens	*Not Likely to Adversely Affect* The whooping crane breeds in central Canada and winters along the Gulf Coast in Texas. Within the project area, occurrence would be limited to the migration season, where the species may utilize freshwater wetlands and croplands. Whooping cranes migrating through the general area are expected to avoid construction activities. If whooping cranes are observed within the project area during construction, activities will stop, the FWS would be notified, and construction activities would resume when cranes have left the area and the FWS gives approval. Therefore, adverse impacts on the whooping crane are not anticipated.

TABLE 4.7.1-1 (cont'd)

Federally Listed Species Potentially Occurring Within the Vicinity of the MIDSHIP Project

Common Name *(Scientific Name)*	Federal Status	Counties Where Species May Occur	*Determination of Effect* and Habitat Assessment
Fish			
Arkansas River Shiner *(Notropis girardi)*	Threatened	Canadian, Garvin, Grady, and Kingfisher	*Not Likely to Adversely Affect* The Arkansas River shiner occurs along about 508.0 miles of the Canadian River in Oklahoma, Texas, and New Mexico, where it congregates in schools on the side of sandbars and ridges within the main channel of the river. The proposed Mainline would be installed beneath the Canadian River (MP 28.4) and adjacent riparian habitats using the HDD method, and the HDD entry and exit locations are each over 1,200 feet from the edge of the waterbody. Midship Pipeline would monitor drilling activities to minimize the potential for an inadvertent release of drilling fluid to affect the Arkansas River shiner, and with the implementation of our recommendation to immediately suspend drilling operations in the event of an inadvertent release to the Canadian River, impacts on this species are not anticipated.
	Critical Habitat		*No destruction or adverse modification of critical habitat* The proposed Mainline would be installed beneath the Canadian River and adjacent riparian habitats designated as critical habitat for the Arkansas River shiner using the HDD method, and the HDD entry and exit locations are each over 1,200 feet from the edge of the waterbody. With the implementation of our recommendation to immediately suspend drilling operations in the event of an inadvertent release to the Canadian River, impacts on the primary constituent elements within designated critical habitat Unit 1b would be avoided.
Invertebrates			
American Burying Beetle (ABB) *(Nicrophorus americanus)*	Endangered	Bryan, Carter, Garvin, and Johnston	*Not Likely to Adversely Affect* The current distribution for the ABB within Oklahoma includes the eastern half of the state, although the species' range has been expanding both westward and eastward in recent years. The ABB is a nocturnal beetle that is active during the summer months (typically mid- to late-May through early September) and spends the winter months buried in the soil. About 75.0 miles of the proposed Mainline would be within the ABB range (approximate Mainline MPs 124.0 to 199.0). Species-specific surveys were conducted along the proposed route in August 2017, which did not document the ABB within the project area. If species-specific surveys are conducted during the 2018 active season for the ABB, and results are negative, impacts on this species would not be anticipated.

Sources: ODWC, 2017d; FWS, 2017e

[a] Species protected under the MBTA (see section 4.7.2).

[b] The black-capped vireo was proposed for delisting on December 15, 2016.

In accordance with section 7 of the ESA, on February 21, 2018, FERC requested the FWS consider the draft EIS, along with various survey reports prepared by Midship Pipeline, as the BA for the MIDSHIP Project, and also requested FWS concurrence for the seven species with *not likely to adversely affect* determinations. We have not yet received concurrence from the FWS.

4.7.1.1 Black-capped Vireo

The black-capped vireo, a small songbird, is a federally listed endangered bird species; this species was proposed for delisting due to recovery on December 15, 2016. The black-capped vireo's breeding range extends from south central Oklahoma south through Texas, and into Mexico (81 Federal Register 90762). The black-capped vireo winters along Mexico's western coastal states (FWS, 2016a). Based on a review of the ONHI database, a total of four black-capped vireos have been documented in Canadian County in the vicinity of the project, the nearest of which is about 9.3 miles from the project area (ONHI, 2017).

The black-capped vireo's breeding habitat is categorized as shrublands and open woodlands. Individual black-capped vireos require a suitable breeding habitat patch of at least 3.7 acres of shrublands with between 35 and 55 percent shrub cover that consists largely of deciduous shrubs, often oaks in mesic areas, and with a low proportion of junipers. Within breeding habitat patches, groupings of shrubs with deciduous foliage from ground level to about 10 feet in height are needed for nest concealment and foraging (FWS, 2017f).

Based on our review, potentially suitable breeding habitat for the black-capped vireo within Canadian County is limited to riparian habitat adjacent to the Canadian River (between Mainline MPs 28.0 and 28.7). Impacts on this potentially suitable habitat are not anticipated because Midship Pipeline proposes to use the HDD construction method to install the pipeline beneath the Canadian River. The HDD entry and exit locations are each over 1,200 feet from the edge of the waterbody, which would avoid impacts on both in-water and riparian habitat. However, if HDD operations were to begin during the black-capped vireo's nesting season, which generally occurs from April 1 to July 31, increased noise and activity levels could cause black-capped vireos to abandon active nests. In the draft EIS, we recommended that Midship Pipeline implement additional mitigation measures to minimize the effects of construction on the black-capped vireo. Midship Pipeline confirmed that, if HDD operations for the Canadian River crossing would occur between April 1 and July 31, it would conduct surveys for active black-capped vireo nests within riparian habitat adjacent to the Canadian River. Before the initiation of surveys, Midship Pipeline would coordinate with the FWS regarding appropriate survey methods for the black-capped vireo. If an active black-capped vireo nest(s) is documented, Midship Pipeline would consult with the FWS to determine appropriate avoidance and mitigation measures. The survey report, any FWS comments on the survey, and its conclusions would be filed with the Secretary. The survey report would include the following information:

- name(s) and qualifications of the person(s) conducting the survey;
- method(s) used to conduct the survey;
- date(s) of the survey;
- area surveyed (include the mileposts surveyed);
- survey results; and
- proposed mitigation to minimize or avoid the potential impacts.

In addition, Midship Pipeline would not commence construction activities associated with the Canadian River crossing between April 1 and July 31 until prior written approval from the Director of OEP is received.

If present along the proposed Mainline route during construction, potential impacts on the black-capped vireo are likely to be limited to temporary avoidance of the area due to increased noise levels and human activity. Because impacts would be temporary (limited to the duration of construction activities), the black-capped vireo is highly mobile, similar habitat is present in the vicinity, and by completing nest surveys and following the proposed mitigation measures, we have determined that the project *is not likely to adversely affect* the black-capped vireo.

4.7.1.2 Least Tern

The interior population (occurring more than 50.0 miles from the Gulf Coast) of least tern is federally listed as endangered.[10] The interior least tern is migratory, breeding along inland river systems in the United States and wintering along the Central American coast and the northern coast of South America from Venezuela to northeastern Brazil (Texas Parks and Wildlife Department, 2017). Based on a review of the ONHI database, a total of 11 least terns have been documented in the vicinity of the project in Kingfisher (10 occurrences) and Grady (1 occurrence) Counties, the nearest of which is about 6.9 miles from the project area (ONHI, 2017).

Interior least terns are known to breed along the Missouri, Mississippi, Ohio, Red, and Rio Grande River systems; within Oklahoma, least terns may be found on portions of the Arkansas, Cimarron, Canadian, and Red Rivers (FWS, 2016b; ODWC, 2017d). Least terns are the smallest member of the gull and tern family, and typically nest in shallow depressions on level ground near water. Nesting habitat for the least tern includes bare or sparsely vegetated sand, shell, and gravel beaches; sandbars; islands; gravel pits; dredge spoil placement areas; salt flats associated with rivers and reservoirs; and occasionally gravel rooftops (FWS, 2016b; ODWC, 2017d; Texas Parks and Wildlife Department, 2017). Based on a review of materials provided by Midship Pipeline, aerial imagery, and coordination with the FWS (Martinez et al., 2017; Stubbs, 2017), potentially suitable nesting habitat is not present in the vicinity of the project area.

The southeastern portion of the project is within the Red River Valley; in this area, there is potential for least terns to utilize waterbody crossings along the proposed Mainline for stopover habitat during migration. In particular, barren areas near the proposed crossings of the Washita River (MP 135.9), Sand Creek (MP 150.3), Pennington Creek (MP 154.1), Little Sandy Creek (MP 156.9), Big Sandy Creek (MP 157.7), Blue River (MP 174.0), and Mall Rider Creek (MP 186.1) could provide stopover habitat for the least tern.

If present along the proposed Mainline route during construction, potential impacts on the least tern are likely to be limited to avoidance of the area due to increased noise levels and human activity. Because impacts would be temporary (limited to the duration of construction activities), the least tern is highly mobile, and ample suitable stopover habitat is present in the vicinity, we have determined that the project *is not likely to adversely affect* the least tern.

4.7.1.3 Piping Plover

The piping plover is a federally threatened shorebird that breeds in the northern United States and Canada and winters along Gulf Coast, South Atlantic, and Caribbean beaches and barrier islands (FWS, 2017g). Based on a review of the ONHI database, the piping plover has not been documented in the vicinity of the project area (ONHI, 2017).

[10] There are three subspecies of least tern: 1) the eastern or coastal least tern, which breeds within 50 miles of the Atlantic or Gulf Coast and is not federally listed as endangered or threatened; 2) the California least tern, which breeds along the Pacific Coast between central California and southern Baja California, Mexico and is federally listed as endangered; and 3) the interior least tern, which is described in this analysis.

Within the project area, potential for the piping plover to occur is limited to migration. Migration is poorly understood, but because the piping plover is not often seen in migration, it is thought that many piping plovers migrate non-stop to wintering grounds (FWS, 2017i; Kaufman, 1996). Areas where the piping plover has been documented utilizing stopover habitat include intertidal flats along the coast and upland sandy beaches further inland (Platt, 2013). Although unlikely, the project area could provide habitat for resting and foraging during migration. If construction activities were to occur within potentially suitable habitat during the migratory season (mid-March through mid-May and mid-July through late October), there is potential for the piping plover to avoid the area due to increased noise and human activity. However, given the apparent rarity for the species to utilize stopover habitat during migration, the isolated areas where sandy beaches are present along the pipeline routes, and the proximity of larger expanses of sandy habitat in the general vicinity of the project (e.g., areas with sandy beach habitat along the Washita, Blue, Canadian, and Red Rivers), we have determined that the project *is not likely to adversely affect* the piping plover.

4.7.1.4 Rufa Red Knot

The rufa red knot is a federally threatened bird species that migrates long distances between nesting areas in the Canadian arctic and several wintering regions, including the southeastern United States. Making one of the longest migrations in the animal kingdom, up to 19,000 miles annually, the rufa red knot utilizes stopover habitat to rest and feed (FWS, 2014a). Based on a review of the ONHI database, the red knot has not been documented in the vicinity of the project area (ONHI, 2017).

Within Oklahoma, nearly all records of the rufa red knot occurred on man-made impoundments: 31 observations have been made on reservoirs, 1 on a sewage lagoon, 2 on fish hatchery ponds, 1 on a pond in a river flood plain, 3 on managed wetland complexes, and 1 on the Arkansas River (ODWC, 2013). Available data does not indicate that rufa red knots use shallow wetlands, ponds, or streams on those rare occasions when they have been documented making landfall in Oklahoma (ODWC, 2013).

Although a total of 15 ponds are located along the proposed pipeline routes, based on our review, none of these appear to be manmade. Ponds along the proposed route could provide potentially suitable stopover habitat for the rufa red knot; however, because this species occurs almost exclusively on man-made impoundments, it is not expected to be present within the project area. Therefore, we have determined that the project would have *no effect* on the rufa red knot.

4.7.1.5 Whooping Crane

The whooping crane is a federally endangered bird species that migrates from its nesting grounds in Wood Buffalo National Park and adjacent areas in central Canada to its wintering grounds in the coastal marshes of Texas. Fall migration begins in mid-September, with most birds arriving on the Texas wintering grounds between late October and mid-November; spring migration departure dates are normally between late March and mid-April, with the last birds usually leaving by May 1 (FWS, 2011a). The whooping crane's migration route is well-defined, and 94 percent of all observations occur within a 200-mile-wide corridor during spring and fall migration (Canadian Wildlife Service and FWS, 2007). Shallow, seasonally and semi-permanently flooded freshwater wetlands with emergent vegetation are used most often as roosting sites during migration, but individuals have been documented roosting within wetland habitats adjacent to both lakes and rivers and within various croplands (FWS, 2013a, 2013b; Canadian Wildlife Service and FWS, 2007). Within Oklahoma, the whooping crane often utilizes stopover habitat within the Salt Plains National Wildlife Refuge (about 65.0 miles north of the Chisholm Lateral [FWS, 2013a]). Based on a review of the ONHI database, a total of 10 whooping cranes have been documented in the vicinity of the project in Canadian (4 occurrences), Kingfisher (5 occurrences), and Stephens (1 occurrence) Counties, the nearest of which is about 2.5 miles from the project area in Canadian County (ONHI, 2017).

With the exception of the portion of the Mainline through Bryan County, the proposed pipeline routes would be installed within the 200-mile-wide migratory corridor described above. As currently scheduled, construction of the project would occur during both the fall and spring migration seasons. Based on a review of materials provided by Midship Pipeline, aerial imagery, and coordination with the FWS, migratory stopover habitat for the whooping crane is present within the project area (Martinez et al., 2017). Because construction activities are scheduled to occur during the fall migratory season, there is potential for the whooping crane to avoid the area due to increased noise and human activity. The whooping crane is a highly mobile species and suitable habitat is present in the vicinity of the project area. To further reduce potential impacts on this species, EIs would monitor the project area and if whooping cranes are observed, construction activities at that location would cease. Midship Pipeline has committed to notifying the FWS of the observation and would only resume construction after the cranes have the left the area and the FWS provides approval. Because impacts on this species would be temporary, and because construction activities would cease if a whooping crane is observed in the project area, we have determined that the project *is not likely to adversely affect* the whooping crane.

4.7.1.6 Arkansas River Shiner

The Arkansas River shiner is a federally threatened fish species that inhabits wide and shallow prairie rivers with sandy bottoms. Throughout its life cycle, it is thought to use various microhabitats within these river systems (ODWC, 2016b). The Arkansas River shiner, a small minnow, often congregates in schools on the lee side of sandbars and ridges and rarely occurs in the open water of the main river channel (ODWC, 2016c). Historically, the Arkansas River shiner was widespread and abundant throughout the western portion of the Arkansas River basin in Kansas, New Mexico, Oklahoma, and Texas. This species is no longer present within over 80 percent of the historical range, and is now almost entirely restricted to about 508.0 miles of the Canadian River in Oklahoma, Texas, and New Mexico (FWS, 2011b).

The species is thought to be in peak reproductive condition (and thus spawns) between May and July; however, spawning may occur as early as April and as late as September (70 Federal Register 59808–59846) (Wilde et al., 2000; Polivka and Matthews, 1997). This timing coincides with the period when water flow is typically highest. The Arkansas River shiner's eggs are semibuoyant, and remain suspended in the water column, developing as they are carried downstream. As a result, the species needs more than 130.0 miles of unimpounded, flowing water to successfully complete its reproductive cycle (FWS, 2005).

The proposed Mainline would cross the Canadian River at MP 28.4, which is a portion of the river known to support the Arkansas River shiner (see discussion relating to Designated Critical Habitat for this species, below). The ONHI provided 10 records documenting a total of 15 Arkansas River shiner in the general vicinity of the proposed project area (ONHI, 2017).

Midship Pipeline plans to install the proposed Mainline beneath the Canadian River using the HDD method; the HDD entry and exit locations are each over 1,200 feet from the edge of the waterbody, which would avoid impacts on both in-water and riparian habitat. The Canadian River would not be used as a surface water source for hydrostatic test water or drilling mud, nor would hydrostatic test water be discharged into the Canadian River.

In an email dated February 9, 2017, the FWS indicated that although the HDD method can be generally effective at avoiding effects on aquatic species and their habitats, inadvertent returns of drilling fluid have sometimes occurred during the HDD process (FWS, 2017h). Consequently, the FWS has recently begun to recommend that directional drilling be monitored to detect and enable responses to accidental releases of drilling fluids into stream channels and riparian habitat. Midship Pipeline would implement the

measures identified in its HDD Plan (see appendix F), which includes several measures to monitor and control drilling fluids, including the following:

- monitoring drilling mud pressure;
- observing the crossing area;
- patrolling the right-of-way and adjacent areas; and
- comparing the injection flow rate and return flow rate to determine loss of drilling fluids.

In the event of an in-stream inadvertent release, Midship Pipeline would implement containment measures. An inadvertent release of drilling fluid could result in increased turbidity, potentially affecting the gills of Arkansas River shiners present in the vicinity of the release, or in areas immediately downstream. Because shiner eggs are semibuoyant, an inadvertent release of drilling fluid, and subsequent settling of bentonite, would not be expected to affect developing Arkansas River shiner. In the draft EIS, we recommended that Midship Pipeline revise the language in its HDD Plan to minimize the potential for adverse impacts on water quality within the Canadian River. Midship Pipeline confirmed that, in the event of an inadvertent release of drilling mud within the Canadian River or within the 300 feet of adjacent riparian habitat, it would immediately notify FERC and the FWS and contain the released drilling mud. FERC and FWS approval would be required prior to resuming drilling operations or commencing any cleanup operations within or adjacent to the Canadian River.

Because no in-water activities are proposed in the Canadian River, and with the implementation of the monitoring measures described above, we have determined that the proposed project *is not likely to adversely affect* the Arkansas River shiner.

Designated Critical Habitat

Critical habitat has been designated within a total of 533.0 miles of the Canadian and Cimarron Rivers in Kansas and Oklahoma. Designated critical habitat also includes 300 feet of adjacent riparian area measured laterally from each bank of the river (66 Federal Register 18001). The specific biological and physical features, referred to as the primary constituent elements, that provide for the physiological, behavioral, and ecological requirements of the Arkansas River shiner are derived from its biological needs. These features include adequate spawning flows over sufficient distances; habitat for food organisms; appropriate water quality; a natural flow regime; rearing and juvenile habitat appropriate for growth and development to adulthood; and suitable habitat (e.g., sufficient flows and lack of barriers) sufficient to allow the Arkansas River shiner to recolonize upstream habitats.

The proposed Mainline crosses designated critical habitat Unit 1b (Canadian River) at MP 28.4. As described above, Midship Pipeline plans to install the proposed Mainline beneath the Canadian River using the HDD method, and the HDD entry and exit locations are each over 1,200 feet from the edge of the waterbody. Therefore, impacts on the primary constituent elements within designated critical habitat Unit 1b would be avoided and *no destruction or adverse modification of critical habitat* is anticipated.

4.7.1.7 American Burying Beetle

The ABB is federally listed as endangered. However, on March 16, 2016, the FWS issued a notice that the August 18, 2015 petition by the American Stewards of Liberty, Independent Petroleum Association of America, Texas Public Policy Foundation, and Dr. Steven W. Carothers presented substantial scientific or commercial information indicating that delisting the ABB may be warranted (81 Federal Register 14058). Therefore, the FWS has initiated a review of the status of the ABB to determine if delisting is warranted.

Historically, the ABB occurred in 35 states within the United States, the District of Columbia, and 3 Canadian provinces (FWS, 1991, 2016b). The current distribution for the ABB includes natural

populations in Arkansas, Kansas, Nebraska, Ohio, Oklahoma, Rhode Island, South Dakota, and Texas, as well as experimental populations in Massachusetts and Missouri (FWS, 2014b, 2017j). Within Oklahoma, the ABB's range includes the eastern half of the state, although the species' range has been expanding both westward and eastward in recent years (FWS, 2016c). The FWS has identified ABB Conservation Priority Areas, where conservation efforts should be focused. These areas are likely to have documented presence over multiple years; relatively high-density populations; suitable breeding, feeding, and sheltering habitat; and carrion resources (FWS, 2016d).

The ABB is a nocturnal beetle that is active during the summer months (typically mid- to late-May through early September) and spends the winter months buried in the soil where temperatures are below 60 degrees Fahrenheit (° F) (FWS, 2014b, 2017j). When the air temperature is consistently above 60° F, they emerge from the soil and begin mating and reproduction. As both adults and larvae, the ABB is dependent on carrion (flesh of dead animals) for food and reproduction (FWS, 2016d).

The ABB is considered to be a generalist in terms of foraging habitat, and inhabits native grassland, grazed pasture, riparian areas, coniferous forest, mature forest, and oak-hickory forest, and has been documented within a variety of soil types (FWS, 2016c). However, the ABB is thought to have more selective breeding habitat (Anderson, 1982). In order to bury carrion, soil characteristics are thought to be important to the ABB; suitable soils typically include well-drained soils, such as fine sandy loams and silt loams with a clay component and a well-formed detritus layer (FWS, 2014b; Willemssens, 2015).

The FWS (2016b) states that areas exhibiting the following characteristics are *unfavorable* for use by ABBs based on disturbance regime, vegetation structure, unsuitable soil conditions, and carrion availability:

- land that is tilled on a regular basis, planted in monoculture, and does not contain native vegetation;
- pasture or grassland that has been maintained through frequent mowing, grazing, or herbicide application at a height of 8 inches or less;
- land that has already been developed and no longer exhibits surficial topsoil, leaf litter, or vegetation;
- urban areas with maintained lawns, paved surfaces, or roadways;
- stockpiled soil without vegetation; and
- wetlands with standing water or saturated soils (defined as sites exhibiting hydric soils, and vegetation typical of saturated soils, and/or wetland hydrology).

Based on the current range for the ABB, about 75.0 miles of the proposed Mainline would be within the ABB range (about Mainline MPs 124 to 199) (FWS, 2016c). The proposed route does not cross any of the identified Conservation Priority Areas, although it is about 5 miles south of an identified Conservation Priority Area near Mainline MP 180.0 (FWS, 2016c). Based on a review of the ONHI database and discussions with the FWS, 14 ABBs have been documented in the vicinity of the project in Johnston (13 occurrences) and Bryan (1 occurrence) Counties, the nearest of which is about 0.1 mile from the project area in Bryan County (ONHI, 2017; FWS, 2018).

Midship Pipeline conducted species-specific surveys for the ABB during the 2017 survey season, which did not document the presence of the ABB within the project area. In the draft EIS, we recommended Midship Pipeline conduct surveys during the ABB's 2018 active season. Midship Pipeline confirmed it has scheduled surveys during the ABB's 2018 active season, which would be conducted in accordance with

the accepted ABB survey protocol. The report, and any FWS comments on the survey and its conclusions, would be filed with the Secretary. The survey report would include:

- name(s) and qualifications of the person(s) conducting the survey;
- method(s) used to conduct the survey;
- date(s) of the survey;
- area surveyed (include the mileposts surveyed);
- survey results; and
- proposed mitigation to minimize or avoid the potential impacts.

Because species-specific surveys were conducted during the ABB's 2017 active season, and the ABB was not documented within the project area, we conclude that it is unlikely that the ABB is present in the project area. Therefore, we have determined that the proposed project *is not likely to adversely affect* the ABB if the 2018 survey results do not document the presence of the ABB within that portion of the project area within the ABB's range (Johnston, Carter, and Bryan Counties) between Mainline MPs 124 and 199.

As stated above, Midship Pipeline confirmed it has scheduled surveys during the ABB's 2018 active season, which would be conducted in accordance with the accepted ABB survey protocol. Therefore, **we recommend that:**

- **Prior to construction, Midship Pipeline should complete species-specific surveys for the ABB during the ABB's 2018 active season. If these surveys identify the presence of ABB in the project area, Midship Pipeline should not begin construction of the MIDSHIP Project until:**

  a. **Midship Pipeline files with the Secretary a project-specific mitigation plan for the ABB that demonstrates how avoidance and mitigation will be accomplished; and**

  b. **the FERC staff receives documentation of FWS concurrence with the plan.**

If the surveys conducted during the ABB's 2018 active season document the presence of ABB, we would be required to reinitiate consultation with the FWS for the ABB. Midship Pipeline would not be authorized to construct until it receives written approval from the Director of OEP, pending completion of consultation with the FWS. In addition, the FWS has established best management practices and a mitigation strategy (land conservation), which Midship Pipeline would be required to implement in the event that the ABB is encountered during construction.[11]

4.7.1.8 Conclusion

Consultation with the FWS regarding potential impacts on federally listed species along the proposed pipeline routes is ongoing. As such, concurrence with our determinations of effect has not been

[11] The FWS Southwest Region's *American Burying Beetle Impact Assessment for Project Reviews* is available online at: https://www.fws.gov/southwest/es/oklahoma/documents/abb/surveying%20final/abb%20impact%20assessment%20for%20project%20reviews_30march2016_final.pdf.

received. Midship Pipeline, FERC, and the FWS will continue to discuss the potential impacts on federally listed species along the proposed routes. To ensure compliance with the ESA, **we recommend that:**

- **Midship Pipeline should not begin construction of the MIDSHIP Project until:**
  - **a. the FERC staff receives comments from the FWS regarding the MIDSHIP Project;**
  - **b. the FERC staff completes ESA consultation with the FWS; and**
  - **c. Midship Pipeline has received written notification from the Director of OEP that construction or use of mitigation may begin.**

Further, should a federally listed species be identified during construction of the project that may be affected by that construction, Midship Pipeline would stop construction activities until FERC reinitiates consultation with the FWS, consultation is completed, and Midship Pipeline is granted approval to restart construction in that area. Therefore, we conclude that impacts on special status species would be adequately avoided or minimized.

4.7.2 Migratory Birds

Migratory birds are federally protected by the MBTA. The MBTA (16 USC 703-711) as amended, implements protection of many native migratory game and non-game birds, with exceptions for the control of species that cause damage to agricultural or other interests. The MBTA prohibits the take of any migratory bird or their parts, nests, and eggs, where "take" means to "pursue, hunt, shoot, wound, kill, trap, capture, or collect."

Executive Order 13186 requires that all federal agencies undertaking activities that may negatively affect migratory birds take a prescribed set of actions to further implement the MBTA, and directs federal agencies to develop a memorandum of understanding (MOU) with the FWS that promotes the conservation of migratory birds through enhanced collaboration between the two agencies. FERC entered into a MOU with the FWS in March 2011. The focus of the MOU is on avoiding or minimizing adverse impacts on migratory birds and strengthening migratory bird conservation through enhanced collaboration between the two agencies.

Though all migratory birds are afforded protection under the MBTA, both Executive Order 13186 and the MOU require that Birds of Conservation Concern (BCC) and federally listed species be given priority when considering effects on migratory birds. BCCs are a subset of MBTA-protected species identified by the FWS as those in the greatest need of additional conservation action to avoid future listing under the ESA. Executive Order 13186 states that emphasis should be placed on species of concern, priority habitats, key risk factors, and that particular focus should be given to addressing population-level impacts.

Bird Conservation Regions (BCR) are regions that encompass landscapes with similar bird communities, habitats, and resource management issues (North American Bird Conservation Initiative, 2017). BCRs were established to facilitate a regional approach to bird conservation and to identify overlapping or conflicting conservation priorities. The project is within three BCRs, including the Central Mixed-grass Prairie (BCR 19), Oaks and Prairies (BCR 21), and West Gulf Coastal Plain/Ouachitas (BCR 25). A total of 58 priority migratory bird species were identified in the general vicinity of the project area, 24 of which breed in the area (FWS, 2008, 2016c, 2016e, 2017k; Cornell Lab of Ornithology, 2017).[12] Table 4.7.2-1 lists BCCs and priority species for which potentially suitable habitat may be present within

[12] This includes 53 BCC species that regularly occur in the general vicinity of the project area and 5 federally listed species.

the project area. Potential impacts on migratory birds that are also federally listed as threatened or endangered are described in section 4.7.1.

The increased presence of humans, noise, and vibrations associated with project activities would likely cause sensory disturbances of migratory birds. The resulting negative effects are expected to be intermittent and short term, occurring during work hours and ceasing after construction activities have moved from a given area. Displacement and avoidance of the area are direct responses to sensory disturbances. Birds may be injured or suffer mortality as an indirect effect of fleeing an area of disturbance. Sensory disturbances to adults could also result in nest abandonment, affecting egg-laying and potentially causing the mortality of young. In most cases, project activities would be short-term and episodic. As such, sensory disturbance effects associated with these activities may affect individuals but would not likely have notable effects on any local populations of migratory birds. Permanent aboveground structures, such as compressor stations, would create potential localized sensory disturbances for the operational life of the project, and thus would have more permanent effects.

Project construction would result in one-time direct impacts on migratory bird habitat with associated indirect impacts. Habitat removal and/or modification during construction and the long-term or permanent conversion of habitats associated with tree clearing and the maintenance of rights-of-way would have indirect effects on migratory birds. These activities could affect egg and young survival and result in bird displacement impacts on bird migration, nesting, foraging, and mating behaviors. Construction could also reduce the amount of habitat available for foraging and predator protection and would temporarily displace birds into adjacent habitats, which could increase the competition for food and other resources. The impact of grading, clearing, and excavation of open uplands, agricultural lands, non-forested wetlands, and developed lands would be short in duration because these land use types would likely return to their preconstruction conditions within 1 to 5 years. The effect of clearing, grading, and right-of-way maintenance in upland and wetland forested habitats would be more prominent and long-term to permanent because these areas may not be restored to their preconstruction condition potentially for decades, if at all. Several large forested tracts would be affected, which would reduce the amount of interior habitat available to forest-dwelling bird species (see section 4.6.1.2). Additionally, construction activities would likely begin in the fall of 2018 and conclude in the summer of 2019, which would include the peak nesting season (March 1 to July 31). To minimize these impacts, the pipeline routes would be collocated through the majority of the forested areas, reducing overall impacts on adjacent forested communities and forest fragmentation. Further, migratory birds not already nesting would be able to avoid these activities and move to abundant habitat adjacent to the right-of-way. Therefore, we conclude that impacts on migratory birds from construction of the project would be temporary and would not be significant.

To further minimize impacts, and in response to a draft EIS recommendation, Midship Pipeline committed to conducting preconstruction migratory bird nesting surveys within 1 week prior to vegetation clearing during the peak nesting season. Surveys would be conducted by qualified biologists in accordance with Midship Pipeline's *Migratory Bird Conservation Plan* and the *Oklahoma Ecological Services Field Office Migratory Bird and Eagle Impact Avoidance Measures for Actions Associated with Oil and Gas Projects.*[13]

[13] Midship Pipeline's *Migratory Bird Conservation Plan* can be accessed online at https://elibrary.ferc.gov/idmws/file_list.asp?document_id=14619329. In the draft EIS, we recommended Midship Pipeline modify its *Migratory Bird Conservation Plan* to state that it would conduct migratory bird nesting surveys within 1 week prior to vegetation clearing, rather than 2 weeks prior to vegetation clearing. Midship Pipeline confirmed it would conduct bird nesting surveys within 1 week prior to vegetation clearing on March 29, 2018 (see accession no. 20180329-5230).

TABLE 4.7.2-1

Birds of Conservation Concern and Priority Species in the Vicinity of the MIDSHIP Project Area

Common Name	Scientific Name	Colonial Waterbird	Breeds in Region	Nesting Habitat [a]		
				Ground	Shrub	Tree
American kestrel	*Falco sparverius paulus*	-	X	o	o	X
Bachman's sparrow	*Aimophila aestivalis*	-	-	-	-	-
Bald eagle	*Haliaeetus leucocephalus*	-	-	-	-	-
Bell's vireo	*Vireo bellii*	-	X	o	X	o
Bewick's wren	*Thryomanes bewickii*	-	X	o	o	X
Black-capped vireo [b]	*Vireo atricapilla*	-	X	o	o	X
Black rail	*Laterallus jamaicensis*	X	-	-	-	-
Brown-headed nuthatch	*Sitta pusilla*	-	-	-	-	-
Buff-breasted sandpiper	*Tryngites subruficollis*	-	-	-	-	-
Burrowing owl [c]	*Athene cunicularia*	-	X	X	o	o
Cassin's sparrow	*Aimophila cassinii*	-	X	X	o	o
Cerulean warbler	*Setophaga cerulea*	-	-	-	-	-
Chestnut-collared longspur	*Calcarius ornatus*	-	-	-	-	-
Chuck-will's-widow	*Antrostomus carolinensis*	-	X	X	o	o
Dickcissel [c]	*Spiza americana*	-	X	o	X	o
Fox sparrow [c]	*Passerella iliaca*	-	-	-	-	-
Golden eagle [c]	*Aquila chrysaetos*	-	-	-	-	-
Harris's sparrow	*Zonotrichia querula*	-	-	-	-	-
Henslow's sparrow	*Ammodramus henslowii*	-	-	-	-	-
Hudsonian godwit	*Limosa haemastica*	-	-	-	-	-
Kentucky warbler	*Geothlypis formosa*	-	-	-	-	-
Lark bunting	*Calamospiza melanocorys*	-	X	X	o	o
Least bittern	*Ixobrychus exilis*	X	-	-	-	-
Least tern [b]	*Sterna antillarum*	-	X	X	o	o
Lesser prairie-chicken	*Tympanuchus pallidicinctus*	-	X	X	o	o
Little blue heron	*Egretta caerulea*	X	X	o	o	X
Loggerhead shrike	*Lanius ludovicianus*	-	X	o	o	X
Long-billed curlew	*Numenius americanus*	-	-	-	-	-
Louisiana waterthrush	*Parkesia motacilla*	-	X	X	o	o
Marbled godwit	*Limosa fedoa*	-	-	-	-	-
McCown's longspur	*Rhynchophanes mccownii*	-	-	-	-	-
Mississippi kite	*Ictinia mississippiensis*	-	X	o	o	X
Mountain plover	*Caradrius montanus*	-	-	-	-	-

TABLE 4.7.2-1 (cont'd)

Birds of Conservation Concern and Priority Species in the Vicinity of the MIDSHIP Project Area

Common Name	Scientific Name	Colonial Waterbird	Breeds in Region	Nesting Habitat [a]		
				Ground	Shrub	Tree
Orchard oriole	*Icterus spurius*	-	X	o	o	X
Painted bunting	*Passerina ciris*	-	X	o	X	o
Peregrine falcon	*Falco peregrinus*	-	-	-	-	-
Piping plover [b]	*Charadris melodus*	-	-	-	-	-
Prairie warbler	*Setophaga discolor*	-	-	-	-	-
Prothonotary warbler	*Protonotaria citrea*	-	X	o	o	X
Rufa red knot [b]	*Caladris canutus rufa*	-	-	-	-	-
Red-headed woodpecker	*Melanerpes erythrocephalus*	-	X	o	o	X
Rufous-crowned sparrow [c]	*Aimophila ruficeps*	-	X	X	o	o
Rusty blackbird [c]	*Euphagus carolinus*	-	-	-	-	-
Scissor-tailed flycatcher	*Tyrannus forficatus*	-	X	o	o	X
Short-billed dowitcher	*Limnodromus griseus*	-	-	-	-	-
Short-eared owl [c]	*Asio flammeus*	-	-	-	-	-
Smith's longspur	*Calcarius pictus*	-	-	-	-	-
Snowy plover	*Charadrius nivosus*	-	X	X	o	o
Solitary sandpiper	*Tringa solitary*	-	-	-	-	-
Sprague's pipit	*Anthus spragueii*	-	-	-	-	-
Swainson's hawk	*Buteo swainsoni*	-	X	o	o	X
Swainson's warbler	*Limnothlypis swainsonii*	-	X	o	X	o
Swallow-tailed kite	*Elanoides forficatus*	-	-	-	-	-
Upland sandpiper	*Bartramia longicauda*	-	-	-	-	-
Whooping crane [b]	*Grus americana*	X	-	-	-	-
Wood thrush	*Hylocichla mustelina*	-	-	-	-	-
Worm-eating warbler	*Helmitheros vermivorum*	-	-	-	-	-
Yellow rail	*Coturnicops noveboracensis*	X	-	-	-	-

Sources: FWS, 2008, 2016c, 2016e, 2017k; Cornell Lab of Ornithology, 2017.

[a] Nesting habitat type is only provided for those species who breed in the general vicinity of the project area.

[b] Species listed as threatened or endangered under the Endangered Species Act and discussed further in section 4.7.2.

[c] Migratory birds identified by the FWS as potentially affected by the project (FWS, 2016c, 2016e, 2017k).

Notes: "-" = not applicable; "o" = does not nest in habitat type

If bird nesting is observed, Midship Pipeline has agreed to establish an avoidance buffer around the nest(s). Construction activities, including clearing, would not occur within 10 feet of the nest until nesting activities have concluded (i.e., chicks have fledged). Minimization measures during construction would include delaying construction in certain areas, expediting construction in certain areas, implementing dust abatement measures, and other measures identified in coordination with the FWS to minimize disturbance to nesting birds.

Operational impacts on migratory birds would be limited to minor maintenance and vegetation clearing operations, which would be conducted outside of the peak nesting season (March 1 to July 31), which would avoid direct impacts on migratory birds. Further, routine vegetation mowing or clearing within the operational right-of-way would not be conducted more frequently than once every 3 years. As such, population-level impacts on migratory birds would be minimized and reduced to less than significant levels. With implementation of these mitigation measures, we conclude that impacts from project operations on migratory birds would be temporary and minor, and impacts on migratory bird populations would not be significant.

4.7.3 Bald and Golden Eagles

Although the bald eagle was removed from the federal list of threatened and endangered species by the FWS on July 9, 2007 (72 Federal Register 37346), bald and golden eagles are still protected under the Bald and Golden Eagle Protection Act (16 USC 668-668d), which prohibits the taking of eagles, their eggs, or their nests. Bald eagles are known to occur in Oklahoma throughout the year. Although the largest numbers of bald and golden eagles occur in Oklahoma during the non-breeding season (with winter roosting peaking during the months of January and February), nesting bald eagles have increased each year since 1990 and about 200 nesting bald eagles are now present in the state (FWS, 2008; ODWC, 2011, 2017f, Martinez et al., 2017).

Bald eagles generally nest near coastlines, rivers, large lakes, or streams that support an adequate food supply. They often nest in mature trees; snags (dead trees); cliffs; rock promontories; and with increasing frequency on manmade structures such as power poles and communication towers. In forested areas, bald eagles often select the tallest trees with limbs strong enough to support a nest that can weigh more than 1,000 pounds (FWS, 2007).

An abundant, readily available food supply in conjunction with one or more suitable night roost sites is the primary characteristic of winter habitat. The majority of wintering eagles in Oklahoma are found near open water (most often lakes and reservoirs) where they feed on fish and waterfowl. Mammalian carrion is an important alternate source of food at some locations (ODWC, 2011; FWS, 2011c).

Based on a review of the ONHI database, nine bald eagles have been documented in the vicinity of the project, which ranged from about 1.4 to 22.1 miles from the project area; the golden eagle has not been documented in the vicinity of the project area (ONHI, 2017). One bald eagle was observed in the project area during field surveys near Mainline MP 83.5; the golden eagle was not observed during surveys.

As described above, bald eagles typically nest near large waterbodies. Along the proposed route, large waterbodies (e.g., Canadian River) would be crossed using the HDD method, which would avoid impacts on adjacent large trees. To further reduce potential impacts on bald eagles, preconstruction surveys for bald and golden eagles would be performed in accordance with the project-specific *Migratory Bird Conservation Plan*. If Midship Pipeline was to discover an eagle nest during surveys or project-related activities, it would adhere to the general migratory bird avoidance measures and FWS avoidance measures specific to eagles in the *Oklahoma Ecological Services Field Office Migratory Bird and Eagle Impact Avoidance Measures for Actions Associated with Oil and Gas Projects* (FWS, 2014c). With the implementation of these measures, we have determined that impacts on bald eagles would be temporary and minor.

4.7.4 State-listed Species

In addition to the ESA at the federal level, the state of Oklahoma has passed laws to protect state-listed species. The overall goal of the state endangered species laws is to conserve, protect, restore, and enhance any threatened or endangered species. Four wildlife species are currently listed as state-threatened

or state-endangered in Oklahoma, none of which occur in counties crossed by the project (ODWC, 2017d). Therefore, we conclude the project would not affect state-listed protected species.

4.8 LAND USE, SPECIAL INTEREST AREAS, AND VISUAL RESOURCES

4.8.1 Land Use

This section describes the land requirements for construction and operation of the MIDSHIP Project, the current use of the lands, and provides an evaluation of project-related impacts. The MIDSHIP Project would involve construction and operation of the following pipeline facilities:

- about 199.7 miles of new 36-inch-diameter mainline pipeline in Kingfisher, Canadian, Grady, Garvin, Stephens, Carter, Johnston, and Bryan Counties (the Mainline);
- about 20.5 miles of new 30-inch-diameter lateral pipeline in Kingfisher County (the Chisholm Lateral);
- about 13.8 miles of new 16-inch-diameter lateral pipeline in Stephens, Garvin, and Carter Counties (the Velma Lateral); and
- about 0.1 mile of new 24-inch-diameter tie-in piping in Canadian County (Tie-in Piping).

Of the 234.1 miles of mainline, lateral, and tie-in pipeline, about 127.0 miles (54 percent) would be collocated with or adjacent to existing rights-of-way.

The MIDSHIP Project would also include the following aboveground facilities:

- three new compressor stations;
- one booster station;
- eight new receipt meters;
- two receipt taps;
- four new delivery meters; and
- associated MLVs and pig launchers/receivers.

In addition to the land associated with the pipeline rights-of-way and aboveground facility sites, Midship Pipeline would temporarily use 3 contractor yards and 116 access roads during construction of the MIDSHIP Project. Of the access roads, 25 would be permanently retained for operation of the project.

The proposed facilities are described in detail in section 2.0.

4.8.1.1 Environmental Setting

Table 4.8.1-1 summarizes the land use impacts associated with construction and operation of the MIDSHIP Project. The project would affect six general land use types, defined as follows:

- forest: oak and pine forests, bottomland floodplain forest, and forested wetlands;
- agricultural: cultivated land and hayfields;
- open land: rangeland and pasture; shrubland, including emergent and scrub-shrub wetlands; and existing utility rights-of-way;

- residential: rural farmsteads, suburban homes, and associated outbuildings, lawns, and landscape trees and shrubs;
- developed land: paved roads, railroads, and land developed for industrial or commercial use, including land developed for mineral leases; and
- open water: ponds and wider[14] streams and rivers.

Construction of the MIDSHIP Project would affect a total of 3,340.7 acres of land. About 91 percent of this acreage would be utilized for the pipeline facilities.[15] The remaining acreage affected during construction would be associated with the aboveground facilities (4 percent), access roads (3 percent), and contractor yards (2 percent). Following construction, lands outside of the permanent right-of-way, ATWS, contractor yards, and temporary access roads would be allowed to revert to their original land use types. With the exception of pecan orchards, agricultural operations within the permanent right-of-way would also be allowed to revert to preconstruction use. The primary land use types affected during construction would be open land (54 percent), agricultural land (28 percent), forest land (14 percent), and developed land (4 percent). Residential land and open water would make up the less than 1 percent of remaining land use types affected during construction of the project.

Operation of the MIDSHIP Project would require 1,474.4 acres of land. About 94 percent of this acreage would be utilized for the permanent pipeline rights-of-way. The remaining land affected would be associated with aboveground facilities (6 percent) and permanent access roads (less than 1 percent). The primary land use types that would be newly affected on a permanent basis are open land (57 percent), agricultural land (28 percent), and forest land (13 percent). Residential land, developed land, and open water comprise the remaining 2 percent of land use types associated with the permanent rights-of-way, aboveground facilities, and permanent access roads.

4.8.1.2 Pipeline Facilities

Table 4.8.1-1 summarizes the land uses that would be affected by construction and operation of the proposed pipeline facilities. While there are no residences within 50 feet of construction workspaces, there are other structures within 50 feet and these are described in section 4.8.3.1.

In general, land use-related impacts associated with the MIDSHIP Project would include the disturbance of existing uses within the right-of-way during construction and a new permanent right-of-way for operation of the pipeline. In upland areas, Midship Pipeline proposes to use a 100-foot-wide construction right-of-way for the Mainline and Chisholm Lateral. In response to a recommendation in the draft EIS, Midship Pipeline proposes to use a 75-foot-wide construction right-of-way for the Velma Lateral and Tie-in Piping. Actual right-of-way configurations and widths would vary based on site-specific conditions including road and railroad crossings, waterbodies and wetland crossings, the need for additional spoil storage, steep topography, the presence or absence of an existing right-of-way, and proximity to adjacent utilities. Reductions of the construction rights-of-way would be made, where practicable, at various locations to address specific environmental or residential issues along the proposed pipelines. Midship Pipeline proposes to use a 75-foot-wide construction right-of-way in wetlands.

[14] "Wider" refers either to waterbodies greater than 100 feet wide or to waterbodies visible on aerial photography (even if less than 100 feet wide).

[15] The receipt taps, MLVs, pig launchers/receivers, and cathodic protection systems would be within the proposed pipeline rights-of-way; therefore, land requirements for these facilities are accounted for in the pipeline facility acreages.

TABLE 4.8.1.-1

Land Use Types Affected by the MIDSHIP Project [a, b]

Facility/County	Forest		Agricultural		Open Land		Residential		Developed Land		Open Water		Total	
	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.
PIPELINES														
Mainline [c]														
Kingfisher	0.0	0.0	2.5	1.0	2.5	1.2	0.0	0.0	0.1	0.1	0.0	0.0	5.1	2.3
Canadian	5.5	2.5	256.7	115.5	86.6	38.5	2.2	1.0	13.1	6.0	0.3	0.1	359.2	163.6
Grady	67.7	29.1	254.3	118.5	327.3	146.7	0.3	0.0	5.8	2.9	0.7	0.3	656.1	297.6
Garvin	53.7	23.2	9.6	4.5	173.9	75.8	0.1	0.0	2.6	1.1	0.3	0.2	240.2	104.8
Stephens	12.5	5.2	3.2	1.4	46.3	20.1	0.0	0.0	2.1	0.9	0.2	0.1	64.2	27.7
Carter	73.2	26.6	59.1	27.5	374.9	170.2	0.3	0.1	4.2	1.9	1.2	0.6	512.9	226.9
Johnston	152.1	60.0	18.3	7.7	230.7	111.6	6.3	2.8	3.5	1.7	2.1	1.1	413.0	184.9
Bryan	52.8	21.0	55.8	26.1	272.6	123.8	4.9	2.4	2.9	1.7	1.2	0.6	390.2	175.7
Subtotal	**417.6**	**167.7**	**654.4**	**302.2**	**1,514.7**	**687.7**	**14.0**	**6.2**	**34.3**	**16.4**	**5.9**	**3.0**	**2,640.2**	**1,182.6**
Chisholm Lateral														
Kingfisher	1.4	0.5	177.9	78.4	90.7	41.9	0.0	0.0	2.4	1.3	0.3	0.2	272.7	122.3
Velma Lateral														
Stephens	16.5	9.3	10.2	6.3	53.8	32.1	0.0	0.0	3.3	1.7	0.5	0.3	84.3	49.8
Garvin	8.8	5.3	4.3	2.7	5.2	3.5	0.0	0.0	0.2	0.1	0.0	0.0	18.6	11.7
Carter	9.4	5.5	5.5	3.4	16.6	9.8	0.0	0.0	0.6	0.3	0.0	0.0	32.1	19.1
Subtotal	**34.7**	**20.1**	**20.0**	**12.5**	**75.6**	**45.9**	**0.0**	**0.0**	**4.1**	**2.2**	**0.5**	**0.3**	**135.0**	**80.5**
Tie-in Piping														
Canadian	0.0	0.0	0.0	0.0	1.0	0.7	0.0	0.0	0.2	0.1	0.0	0.0	1.1	0.8
PIPELINES SUBTOTAL	**453.6**	**188.4**	**852.2**	**393.0**	**1,682.0**	**775.7**	**14.0**	**6.2**	**41.0**	**19.9**	**6.8**	**3.5**	**3,049.6**	**1,386.8**
ABOVEGROUND FACILITIES														
Compressor Stations														
Calumet Compressor Station	0.0	0.0	32.5	16.4	0.0	0.0	0.0	0.0	1.4	1.0	0.0	0.0	33.9	17.3
Tatums Compressor Station	1.1	0.9	0.0	0.0	22.3	18.9	0.0	0.0	0.2	0.2	0.0	0.0	23.5	19.9
Bennington Compressor Station	3.1	2.6	0.0	0.0	31.3	19.4	0.0	0.0	0.1	0.1	0.0	0.0	34.5	22.1
Sholem Booster Station	0.0	0.0	0.0	0.0	6.6	6.6	0.0	0.0	0.3	0.3	0.0	0.0	6.9	6.9
Subtotal	**4.2**	**3.4**	**32.5**	**16.4**	**60.2**	**44.8**	**0.0**	**0.0**	**2.0**	**1.6**	**0.0**	**0.0**	**98.9**	**66.2**
Meter Stations														
Chisholm Meter Station	0.0	0.0	1.3	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.9
Okarche/Mark West Meter Station	0.0	0.0	1.5	1.5	2.5	2.3	0.0	0.0	0.1	0.1	0.0	0.0	4.2	3.9

TABLE 4.8.1-1 (cont'd)

Land Use Types Affected by the MIDSHIP Project [a, b]

Facility/County	Forest		Agricultural		Open Land		Residential		Developed Land		Open Water		Total	
	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.
Canadian Valley Meter Station	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.9	0.7	0.0	0.0	1.0	0.7
Cana Meter Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.2	0.2
Iron Horse Meter Station	0.0	0.0	0.9	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.8
Grady Meter Station	0.1	0.1	0.0	0.0	2.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	2.1	1.7
Velma Meter Station	0.7	0.5	0.0	0.0	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.9
NGPL 801 Meter Station	0.0	0.0	0.0	0.0	2.4	1.9	0.0	0.0	0.1	0.1	0.0	0.0	2.5	2.0
NGPL Meter Station [d]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bennington Meter Station	0.0	0.0	0.0	0.0	3.7	3.7	0.0	0.0	0.1	0.1	0.0	0.0	3.8	3.8
Subtotal	**0.8**	**0.7**	**3.8**	**3.2**	**11.2**	**9.8**	**0.0**	**0.0**	**1.4**	**1.2**	**0.0**	**0.0**	**17.3**	**14.9**
ABOVEGROUND SUBTOTAL	**5.0**	**4.1**	**36.3**	**19.5**	**71.4**	**54.6**	**0.0**	**0.0**	**3.4**	**2.8**	**0.0**	**0.0**	**116.2**	**81.1**
Access Roads														
Kingfisher	0.0	0.0	1.0	0.1	1.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	3.4	0.1
Canadian	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	1.4	0.3	0.0	0.0	3.0	0.3
Grady	0.5	0.0	1.5	0.3	7.7	0.2	0.0	0.0	20.8	0.0	0.0	0.0	30.5	0.6
Garvin	2.3	0.1	0.0	0.0	4.8	1.1	0.1	0.0	9.7	2.4	0.0	0.0	16.9	3.5
Stephens	0.2	0.0	0.2	0.0	1.1	0.1	0.0	0.0	7.1	0.6	0.0	0.0	8.7	0.7
Carter	0.6	0.0	0.4	0.0	6.1	0.1	0.0	0.0	18.3	0.0	0.0	0.0	25.3	0.1
Johnston	0.4	0.1	0.2	0.0	3.4	0.6	0.0	0.0	17.1	0.0	0.0	0.0	21.3	0.8
Bryan	0.0	0.0	0.0	0.0	1.8	0.4	0.0	0.0	0.5	0.0	0.0	0.0	2.3	0.4
Subtotal	**4.0**	**0.2**	**5.0**	**0.3**	**26.0**	**2.6**	**0.1**	**0.0**	**76.3**	**3.4**	**0.0**	**0.0**	**111.4**	**6.5**
Contractor Yards														
Chickasha Yard	0.0	0.0	26.5	0.0	0.7	0.0	0.0	0.0	0.2	0.0	0.0	0.0	27.3	0.0
Yukon Yard	0.0	0.0	19.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.3	0.0
Ardmore Yard	0.0	0.0	0.0	0.0	16.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.9	0.0
Subtotal	**0.0**	**0.0**	**45.8**	**0.0**	**17.6**	**0.0**	**0.0**	**0.0**	**0.2**	**0.0**	**0.0**	**0.0**	**63.5**	**0.0**
PROJECT TOTAL	**462.5**	**192.7**	**939.2**	**412.9**	**1,797.0**	**832.8**	**14.2**	**6.2**	**120.8**	**26.1**	**6.8**	**3.5**	**3,340.7**	**1,474.4**

[a] The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends in all cases.
[b] The construction land requirements include both lands temporarily affected by construction (temporary workspace, ATWS, temporary access roads) and lands permanently retained for operation (permanent right-of-way/easement and permanent access roads). Workspace between the HDD entry and exit is not included.
[c] The receipt taps, MLVs, pig launchers/receivers, and cathodic protection systems are within the proposed pipeline rights-of-way; therefore, land requirements for these facilities are accounted for in the pipeline facility acreages.
[d] The NGPL Meter Station would be within the Bennington Compressor Station site and would not result in additional land use impacts.

In addition to the construction right-of-way, various extra workspaces would be used for project construction. As described in section 2.2.3, Midship Pipeline identified several areas where it stated that site-specific conditions require the use of ATWS outside of the proposed nominal construction right-of-way. Appendix D lists the locations of these ATWS, their dimensions, area affected, existing land use, and justification.

About 54 percent of the pipeline facilities would be adjacent to existing easements. Where the pipeline would be installed adjacent to existing pipelines or electric transmission lines, the permanent right-of-way would abut the existing right-of-way to the extent practicable while maintaining minimum spacing safety requirements (see section 2.2.1.1 for more information on installation adjacent to existing rights-of-way).

The land retained as new permanent right-of-way would generally be allowed to revert to its former use, except for forested land. Certain activities such as the construction of permanent structures, including houses, house additions, garages, patios, pools, or other objects not easily removable, or the planting of trees, would be prohibited within the permanent right-of-way. To facilitate pipeline inspection, operation, and maintenance, Midship Pipeline would maintain the entire permanent right-of-way in upland areas in an herbaceous/scrub-shrub vegetated state (with the exception of between the HDD entry and exit locations). This maintained right-of-way would be mowed no more than once every 3 years, but a 10-foot-wide strip centered over the pipeline might be mowed annually to facilitate periodic corrosion/leak surveys of the pipeline. Right-of-way maintenance in wetlands is described in section 4.4.4.

Specific impacts on forest, agricultural, open, and developed land are described below. Impacts on residential areas are described in section 4.8.3.1. Impacts on open water (surface waters) are described in section 4.3.2.

Forest

Forested land affected by the pipeline facilities would be comprised mainly of oak and pine forests; bottomland floodplain forests consisting of cottonwood, willow, and salt cedar; and forested wetlands. Where pipelines would be adjacent to cleared existing utility rights-of-way, effects would be minimized because clearing would represent an expansion of the existing cleared corridor rather than the introduction of a new open corridor within a previously unsegmented forested area. Trees within the cleared temporary construction work areas would be allowed to revert to forest through natural successional processes following construction; however, impacts on forest resources in these areas could take 15 or more years to return to preconstruction conditions. Following construction, the maintained portion of the right-of-way would be permanently converted to cleared, open land. See sections 4.4.4 and 4.5.4 for more information regarding effects on forested areas, including forested wetlands.

Agricultural Land

Agricultural lands affected by construction would include cultivated croplands and hayfields, primarily winter wheat and alfalfa (see also section 4.5.1.1). The primary impacts in these areas would be short-term and would occur during the growing season concurrent with construction. Farmers would experience some loss of crop production in areas directly disturbed by construction-related activities and may have to alter planting patterns to work around areas where access is limited during construction. Grazing animals may also have to be moved to different areas or other fields, and/or be penned with gates (see section 4.8.4 for more information regarding potential impacts on cattle operations).

With the exception of pecan orchards, agricultural operations within the pipeline right-of-way would be allowed to resume following construction. Midship Pipeline would restore agricultural areas disturbed by construction, and would conduct post-construction monitoring to evaluate the success of

restoration. Typical mitigation measures in agricultural areas include topsoil segregation and soil decompaction. Midship Pipeline would compensate landowners for lost production and crop damages resulting from construction of the pipelines in accordance with easement agreements. Agricultural lands, including specialty crops (pecan trees), are addressed in more detail in section 4.8.4.

Open Land

Open lands that would be affected by the MIDSHIP Project include existing utility rights-of way, open fields, rangeland and pasture, vacant land, and herbaceous and scrub-shrub uplands and wetlands. Construction-related impacts on open land would include the removal of vegetation and disturbance of soils. Impacts on open land would be temporary and short-term, and would be minimized by the implementation of the Plan and Procedures. Following construction, most open land uses would be able to continue. However, some activities, such as the building of new commercial or residential structures, would be prohibited on the permanent right-of-way.

Developed Land

Developed land that would be affected by the MIDSHIP Project includes public roads, railroads, and industrial/commercial land, including mineral leases. A detailed list of the road and railroad crossings and the proposed crossing methods is provided in appendix G. Impacts on industrial/commercial land during construction could include increased noise, dust, and impacts on traffic flow. Impacts may also include disruption associated with reduced access to businesses or natural gas wells due to project-related traffic delays or congestion. Midship Pipeline would install the pipeline beneath federal and state highways and railroads using conventional bore or HDD techniques, which would allow for continued use of these facilities during construction. Smaller roads would be crossed using conventional bore or open-cut methods. Section 2.3.2.4 describes road and railroad crossing methods in more detail.

Midship Pipeline would conduct road and railroad crossings in accordance with DOT regulations, applicable state or local permit conditions, and a project-specific *Traffic Management Plan*. Midship Pipeline would implement appropriate traffic management and safety measures for work in public roadways, make arrangements with local officials to have traffic safety personnel present during periods of construction, if necessary, to ensure the safety of the workers and the public, and maintain at least one traffic lane open during construction, except for brief periods when road closure would be required to install the pipeline. More detailed information regarding potential traffic-related impacts and mitigation and Midship Pipeline's pending *Traffic Management Plan* is provided in section 4.9.5. Operation of the MIDSHIP Project would result in few, if any, long-term impacts on industrial/commercial areas.

4.8.1.3 Aboveground Facilities

Table 4.8.1-1 summarizes the land requirements for the aboveground facilities. Construction of the MIDSHIP Project's aboveground facilities would affect a total of about 116.2 acres of land. Of this total, 81.1 acres would be permanently retained for operation. The land uses that would be affected by construction of these facilities include open land (62 percent), agricultural land (31 percent), forest (4 percent), and developed land (3 percent).

Construction of the Calumet Compressor Station would affect 32.5 acres of agricultural land and 1.4 acres of developed land. Operation of the facility would permanently convert 16.4 acres of agricultural land and 1.0 acre of developed land to industrial use. Construction of the Tatums Compressor Station would affect 22.3 acres of open land, 1.1 acres of forest, and 0.2 acre of developed land. Operation of the facility would permanently convert 18.9 acres of open land, 0.9 acre of forest, and 0.2 acre of developed land to industrial use. Construction of the Bennington Compressor Station would affect 31.3 acres of open land, 2.6 acres of forest, and 0.1 acre of developed land. Operation of the facility would permanently

convert 19.4 acres of open land and 0.1 acre of developed land to industrial use. Temporary workspace areas would be allowed to revert to preexisting use following construction, and non-paved and non-graveled areas used during construction would be revegetated. Impacts on visual resources associated with the Calumet, Tatums, and Bennington Compressor Stations are described in section 4.8.8. Construction of the Sholem Booster Station would require 6.6 acres of open land and 0.3 acre of developed land, all of which would be converted to industrial use for operations of the MIDSHIP Project.

Midship Pipeline would construct 10 new meter stations along the pipeline facilities, including the Chisholm, Okarche/Mark West, Canadian Valley, Cana, Iron Horse, Grady, Velma, NGPL 801, NGPL, and Bennington Meter Stations. The NGPL Meter Station would be entirely housed within the Bennington Compressor Station site and would not result in additional land requirements. Construction of the remaining nine meter stations would affect a total of 11.2 acres of open land, 3.8 acres of agricultural land, 1.4 acres of developed land, and 0.8 acre of forest land. During operation, these facilities would permanently convert 9.8 acres of open land, 3.2 acres of agricultural land, 1.2 acres of developed land, and 0.7 acre of forest land to industrial use.

The new receipt taps, MLVs, and pig launchers/receivers, and the associated land requirements, would be entirely within the permanent rights-of-way associated with the pipeline facilities (see section 4.8.1.2).

4.8.1.4 Contractor Yards

Midship Pipeline proposes to use three temporary contractor yards to support construction activities. Use of the contractor yards would temporarily affect about 63.5 acres of agricultural (72 percent), open (28 percent), and developed (less than 1 percent) land. No land associated with the contractor yard sites would be retained during operation of the MIDSHIP Project. The land would be allowed to revert to its former use.

4.8.1.5 Access roads

In addition to public roads, Midship Pipeline proposes to use 116 access roads to construct the MIDSHIP Project. Following project completion, 25 roads would be permanently maintained for operations and 91 temporary access roads would be returned to preexisting use. New or improved temporary access roads may be left in place in accordance with the landowner easements or restored to preconstruction conditions in accordance with the Plan. The location, description, length, land use, and type of improvement required (if any) for each of the access roads are listed in appendix E.

A total of 83 of the permanent and temporary access roads are existing roads that may only need minor modifications, 7 are existing roads that would require new construction to extend their length, and 26 roads would be newly constructed. Of the 25 permanent access roads, 17 roads would be newly constructed, 2 would be extended past their existing footprint, and 6 would only require minor modifications. Midship Pipeline is proposing construction access road widths of between 15 and 30 feet; however, the majority (over 80 percent) would be 25 feet wide. Modifications to existing roads could include widening, grading, installation of culverts, and/or addition of gravel. During construction, access roads would affect 111.4 acres of land, which would primarily be developed land (68 percent). The remaining land would comprise open land (23 percent), agricultural land (5 percent), and forest land (4 percent). The 25 permanent access roads retained for operation of the project would affect 6.5 acres of land, including developed land (52 percent), open land (39 percent), agricultural land (5 percent), and forest land (3 percent).

4.8.2 Land Ownership and Easement Requirements

Pipeline operators must obtain easements from landowners to construct and operate authorized facilities, or acquire the land on which the facilities would be located. Easements can be temporary, granting the operator the use of the land during construction (e.g., extra workspaces, temporary access roads, contractor yards), or permanent, granting the operator the right to operate and maintain the facilities once constructed.

Midship Pipeline would need to acquire easements or land to construct and operate the new pipelines and aboveground facilities. These easements would convey both temporary (for construction) and permanent rights-of-way to Midship Pipeline. An easement agreement between a company and a landowner typically specifies compensation for losses resulting from construction, including losses of non-renewable and other resources, damages to property during construction, and restrictions on existing uses that would not be permitted on the permanent right-of-way. Compensation would be fully determined through negotiations between Midship Pipeline and the landowner.

If an easement cannot be negotiated with a landowner and if the MIDSHIP Project is approved by the Commission, Midship Pipeline may use the right of eminent domain to acquire the property necessary to construct and operate the MIDSHIP Project (see section 1.2). This right would apply to all project-related workspace covered by a Certificate/approval, including the temporary and permanent rights-of-way, aboveground facility sites, contractor yards, access roads, and ATWS. Midship Pipeline would still be required to compensate the landowner for the right-of-way and damages incurred during construction. However, if an easement cannot be negotiated, the level of compensation would be determined by a court according to state or federal law.

4.8.3 Existing Residences, Commercial and Industrial Facilities, and Planned Developments

4.8.3.1 Existing Residential and Commercial Structures

Construction of the MIDSHIP Project would affect about 14.0 acres of residential land, all of which would be associated with the pipelines. No residential lands would be affected by the aboveground facilities. Following construction, residential lands would be restored to preconstruction conditions to the extent practicable. About 6.2 acres of residential land would be within the new permanent pipeline right-of-way and subject to restrictions, such as planting large trees or the placement of certain structures. The remaining 8.1 acres would not be subject to any restrictions, as the land is associated with temporary workspace that would not be retained as a permanent easement. In restoring properties, Midship Pipeline would adhere to the Plan and any specific requirements identified by landowners and agreed to during negotiations. In most cases, property owners would be able to use the permanent right-of-way as they did before construction as long as the use does not conflict with project operation and the terms of the landowner's negotiated easement agreement.

Table 4.8.3-1 lists existing residential and commercial structures within 50 feet of any proposed construction workspace by milepost, and indicates the distance and orientation of each from the proposed workspaces. No residences are within 50 feet of the proposed construction workspace for the MIDSHIP Project; however, there are 17 structures within 50 feet of the proposed construction workspace for the Mainline and Velma Lateral. No structures are within 50 feet of the proposed construction workspace for the Chisholm Lateral or any of the aboveground facilities.

TABLE 4.8.3-1

Structures Within 50 Feet of the MIDSHIP Project Construction Right-of-Way

Facility/County/Approx. Milepost	Tract No.	Building Type	Distance from Proposed Right-of-Way (feet)[a]	Direction From Centerline
MAINLINE				
Grady County				
59.2	GR-0222.010	Shed	5	West
61.6	GR-0293.010	Abandoned fireworks stand	0	Intersects
Carter County				
101.9	CR-0482.000	Shed	8	Southwest
125.8	CR-0840.000	Shed	0	Intersects
126.3	CR-0859.000	Abandoned bus	0	Intersects
133.0	CR-0894.000	Outbuilding	41	North
Johnston County				
151.5	JO-0754.000	Trailer	0	Intersects
155.5	JO-0791.000	Outbuilding [b]	17	North
158.6	JO-0812.000	Camper shell	0	Intersects
Bryan County				
178.7	BR-0901.000	Barn	28	South
179.0	BR-093.000	Barn	38	North
196.4	BR-1001.000	Commercial building	5	North
197.0	BR-1003.000	Commercial building	5	North
VELMA LATERAL				
Stephens County				
VE2.0	VL-ST-0006.000	Pump shack	0	Intersects
Carter County				
VE10.6	VL-ST-0026.000	Commercial building	21	South
Garvin County				
VE12.2	VL-GA-0038.000	Shed	0	Intersects
VE12.8	VL-GA-0040.000	Outbuilding	23	Northwest

[a] Non-structural items such as cattle feeders or water troughs have been omitted from this discussion.
[b] Distance measured from construction right-of-way or ATWS.

Should a residence be identified within 50 feet of project workspace, Midship Pipeline would implement the residential mitigation measures outlined in the Plan, as outlined below:

- install safety fencing along the edge of the construction work area adjacent to and for 100 feet on either side of the residence;
- preserve as many trees and as much landscaping as possible on the residential property;
- restore all lawn areas and landscaping immediately following cleanup operations, or as specified in landowner agreements;
- segregate topsoil where appropriate or as negotiated with the landowner;

- maintain utility service during construction activities; and
- construct only during daylight hours, except where special conditions dictate.

Of the 17 structures within 50 feet, 7 would be intersected by the proposed workspace (see table 4.8.3-1). Midship Pipeline has refined workspace in relation to existing structures and workspace design would be subject to landowner input in conjunction with constructability and environmental impact considerations. For construction, structures that are intersected by workspace would be moved out of the construction right-of-way. The structure at MP VE2.0 cannot be moved, and would be marked and avoided during construction. Following construction, structures that were removed would be relocated to adjacent areas, restored to their original locations, or taken to an approved disposal site, depending on landowner requests. No structures would be relocated to the permanent right-of-way following construction. Landowners would be compensated for damage to or loss of any intact structures.

During construction, effects on buildings and other features adjacent to the pipeline may include noise and dust from construction equipment, removal of structures within the construction workspace, and temporary visual effects from removal of vegetation. Post-construction disturbance would be minimal and related to maintenance activities, including periodic mowing and inspection, as well as the prohibition of growing trees or placement of buildings within the permanent right-of-way. Midship Pipeline would notify landowners by mail of planned construction activities at least 7 days prior to construction on their properties. Construction would typically occur 6 days per week (Monday through Saturday) during daylight hours, with the possible exception of the proposed HDDs, bores, and pipeline commissioning activities, which would typically operate continuously until the activity is complete (see section 4.11.2 for information regarding nighttime noise impacts and mitigation).

Construction through or near residential areas would be done in a manner that minimizes adverse effects on residences, including prompt and thorough cleanup. Landowner access to residences would be maintained at all times, and Midship Pipeline would implement measures to ensure that construction activities do not prevent access to residential areas by fire and emergency vehicles.

Midship Pipeline would implement the following additional mitigation measures, as appropriate, to minimize disruption to nearby residences:

- notify homeowners in advance of any scheduled disruption of household utilities, and keep the duration of the interruption as brief as possible;
- strive to accommodate any special concerns regarding private landscaping and other potential conflicts with the construction and/or operation of the pipeline;
- implement dust control measures (applying water to the right-of-way) during construction as necessary;
- after backfilling, clean up and restore residential areas to preconstruction conditions and remove all construction debris from the area; and
- manage traffic in residential areas to maintain access to residences and safety for landowners during construction.

Midship Pipeline would further minimize effects on residential properties by implementing the measures included in the Plan and its *Traffic Management Plan* (see section 4.9.5 for more information about transportation and traffic).

We conclude that implementation of the identified mitigation measures, plans, and procedures described above would minimize or mitigate the impacts of MIDSHIP Project construction on existing residences and buildings to less than significant levels. Operational impacts would be limited to the encumbrance of a permanent right-of-way, which would prevent the construction of permanent structures within the right-of-way.

4.8.3.2 Planned Developments

Midship Pipeline contacted local and county officials in the affected municipalities and coordinated with local landowners to identify planned residential, commercial, or industrial developments within 0.25 mile of the proposed project facilities.

One landowner identified a platted subdivision near Mainline MP 116.5. To accommodate the planned development, Midship Pipeline modified the proposed route to maintain a minimum of 700 feet between the pipeline and the nearest property line. No other planned residential or commercial developments have been identified within 0.25 mile of the pipeline or aboveground facilities.

Two commentors expressed concerns about the pipeline hindering future use and development of their land. Midship Pipeline has been working directly with landowners to address their specific concerns regarding the future development of their properties. As described in sections 4.8.1.2 and 4.8.3.1, the land retained as new permanent right-of-way would generally be allowed to revert to its former use. In restoring properties, Midship Pipeline would adhere to the Plan and Procedures as well as any specific requirements identified by landowners and agreed to during negotiations. In most cases, property owners would be able to use the permanent right-of-way as they did before construction as long as the use does not conflict with project operation and the terms of the landowner's negotiated easement agreement. However, certain activities, such as the construction of permanent structures or the planting of trees, would be prohibited within the permanent right-of-way. The land outside the permanent right-of-way would not be subject to any restrictions. Midship Pipeline has used collocation to the extent practicable to minimize impacts on new landowners, with the assumption that combining successive pipelines into a single narrow corridor would limit fragmentation and associated impacts on land uses, including development. The project would add 50 feet of width to the existing corridor through the property. Midship Pipeline notes that development in the area of the proposed project is already constrained by the existing pipeline corridor through the properties.

4.8.4 Agricultural Areas

Construction of the MIDSHIP Project would affect about 939.2 acres of agricultural land, of which about 412.9 acres would be retained during operation of the MIDSHIP Project. Construction and operation of the MIDSHIP Project through agricultural land has the potential to result in effects on its use and productivity caused by:

- mixing of topsoil and subsoil;
- soil compaction within restored rights-of-way;
- damage to subsurface drainage systems/drain tiles;

- introduction of excess rock into the subsoil;
- loss of crop production;
- temporary loss of access to agricultural land outside of the construction rights-of-way for equipment and/or livestock;
- temporary or permanent loss of specialty crops;
- modification of surface and groundwater flow patterns; and
- introduction of invasive species/noxious weeds.

Measures Midship Pipeline would use to prevent or minimize impacts on agricultural lands include:

- preservation, segregation, and replacement of topsoil in cultivated or rotated agricultural lands and at the landowner's request in pastures and hayfields;
- a minimum of 3 feet of soil cover over the installed pipeline (4 feet in cropland) unless otherwise specified by the landowner;
- soil decompaction as needed in accordance with the Plan;
- landowner compensation for crop losses and other damages caused by construction; and
- post-construction monitoring to assess the yields of restored areas.

Following construction, all cropland, hay field, and pastureland used for construction of the pipelines would be restored, and prior agricultural uses would be allowed to continue within the permanent right-of-way. Agricultural land within the fenceline of aboveground facilities would be permanently converted to industrial use.

We received a comment regarding the potential effects of the MIDSHIP Project on agricultural land, including potential crop damage, topsoil loss, soil compaction, and pipeline depth of cover in areas where deep tillage is practiced. Midship Pipeline would implement the measures above to prevent or minimize impacts on agricultural lands, such as measures to prevent topsoil loss and soil compaction as described in section 4.2.2.1. With implementation of these measures and our Plan, we conclude that impacts on agricultural land, including areas where deep tillage is practiced, would be adequately minimized.

We also received several comments from landowners regarding the potential effects of the MIDSHIP Project on cattle operations, including potential loss of grazing areas, gates left open, and effects on the health and safety of the cattle. Midship Pipeline has been working directly with landowners to address these specific concerns. In the draft EIS, we requested that Midship Pipeline file a description of the specific mitigation measures it would implement to address the concerns of several affected landowners. In its response to comments on the draft EIS, Midship Pipeline confirmed that it had reached an agreeable resolution with all but one landowner (Don Michael Haggerty). Mr. Haggerty provided comments on several concerns, including, but not limited to, effects on his cattle ranching operation, water resources, wildlife, and safety. As discussed above, pastureland affected by the project would be restored to preconstruction conditions. Mitigation measures to reduce construction impacts on water resources,

wildlife, and safety are addressed in sections 4.3, 4.6, and 4.12, respectively; however, we encourage Midship Pipeline to continue its attempts to consult directly with Mr. Haggerty to address his concerns.

Specialty Agricultural Areas and Organic Farms

The proposed Mainline would cross seven pecan groves, which consist of individual pecan trees scattered within open land (see table 4.8.4-1). No other known specialty agricultural areas would be crossed by the MIDSHIP Project.

TABLE 4.8.4-1

Pecan Groves Crossed by the MIDSHIP Project

County	Begin Milepost	Crossing Length (feet)	Impacts
Garvin	95.5	383	Removal of up to seven trees
Garvin	95.8	824	Removal of up to 10 trees
Carter	101.0	1,324	Removal of up to eight trees
Carter	101.4	29	Removal of up to four trees
Carter	102.4	145	Removal of up to three trees
Carter	134.1	750	Removal of up to 20 trees
Johnston	156.5	180	Removal of up to 15 trees
PROJECT TOTAL		**3,635**	

Midship Pipeline has attempted to minimize effects on pecan groves through avoidance, and would continue to work with individual landowners through the easement process to avoid and minimize impacts where these trees are present. Where avoidance would not be possible, Midship Pipeline would compensate landowners for loss of pecan trees removed during construction of the project.

Based on a search of the Organic Integrity Database maintained by the Oklahoma Department of Agriculture Food and Forestry, no certified organic farm operations have been identified within 0.25 mile of the MIDSHIP Project (Oklahoma Department of Agriculture Food and Forestry, 2017). If an organic farm operation is identified, Midship Pipeline would work with the landowner to develop appropriate construction and restoration procedures to maintain organic certification.

Agricultural Drain Tiles, Irrigation Systems, and Livestock Watering Systems

Midship Pipeline did not identify any agricultural land with existing drain tiles, irrigation structures, or livestock watering systems. If any of these structures/systems are identified through consultations with landowners, Midship Pipeline would work with the landowner to develop appropriate mitigation measures to avoid or minimize impacts during construction of the project. Midship Pipeline attempted to minimize impacts on ponds, including livestock ponds, by routing around them or adjusting workspaces during the initial siting of the pipeline facilities. Potential impacts on ponds, which are scattered throughout the project area, are described in more detail in section 4.3.2.

Agricultural Management Programs

The NRCS and Farm Service Agency (FSA) oversee several voluntary conservation-related programs that work to address farming, ranching, grassland, forested land, and water-related conservation issues (FSA, 2017a; NRCS, 2017b). The Conservation Reserve Program (CRP), which is administered by the FSA, is a voluntary program for agricultural landowners focused on taking highly erodible cropland out of production and stabilizing soil loss through planting permanent cover crops (FSA, 2017b). Landowners enrolled in the CRP receive annual rental payments and cost-share assistance to establish long-term, resource conserving covers on eligible farmland (FSA, 2017b). The long-term goal of the program is to re-establish valuable land cover to help improve water quality, prevent soil erosion, and reduce loss of wildlife habitat. The Conservation Reserve Enhancement Program (CREP), an offshoot of the CRP, is a voluntary program that focuses on conservation issues identified by local, state, or tribal governments or non-governmental organizations (FSA, 2017c). The Oklahoma CREP, which was established to improve specific watersheds within the state, is administered by the FSA with support from other federal and state agencies and private conservation groups (Oklahoma Conservation Commission, 2017). Through CREP, program participants receive financial incentives from the USDA and the Oklahoma CREP to remove cropland or marginal pastureland from agricultural production and convert the land to native grasses, trees, and other vegetation.

In response to Midship Pipeline's Freedom of Information Act request, the FSA identified seven landowners in the vicinity of the proposed Mainline as having CRP easements on their land in Bryan, Kingfisher, and Canadian Counties. The FSA did not identify any CREP easements in the project area. A marketable title search identified nine conservation easements/reservations in Bryan, Johnston, Carter, and Grady Counties, including two easements to the Bryan Soil and Water Conservation District, two USDA conservation easements (quit claim deeds), four easements to the Arbuckle Soil and Water Conservation District, and one easement to the Grady County Soil and Water Conservation District. No WRP, CRP, or CREP easements were identified during the title search. Further consultation with the landowners, including documentation acquired through executed construction questionnaire forms, identified 12 tracts that may be enrolled in conservation or wetland programs in Bryan, Johnston, Carter, and Grady Counties. Because landowners may be unaware that their property is enrolled in a conservation program or may be unwilling to disclose this information, it is possible that additional tracts not yet identified may be enrolled in conservation or wetland programs.

Midship Pipeline stated that it would coordinate with each landowner to determine whether any tracts crossed by the pipelines are enrolled in the CRP. Where CRP easements are identified, Midship Pipeline would work with the specific landowner and the FSA, as needed, to develop appropriate construction and restoration practices that comply with the easement contract for the property. Midship Pipeline would tailor restoration of the construction work areas in open lands to meet the long-term objectives for the land enrolled in these programs; therefore, we conclude construction of the project would result in only temporary impacts in these areas and would not negatively affect program enrollment. However, construction on CRP easements with provisions for trees that overlap the permanent right-of-way would result in a permanent conversion of that portion of land to herbaceous cover, which may result in either removal of that portion of land from the CRP or a conversion to herbaceous cover in the easement contract.

The MIDSHIP Project would not affect any known NRCS program land, such as the Wetland Reserve Program, Grassland Reserve Program, Healthy Forest Reserve Program, or Emergency Watershed Protection – Floodplain Easement Program easements. If Midship Pipeline determines through landowner negotiations that any NRCS easement properties would be crossed by the project, Midship Pipeline would

coordinate with each landowner to implement construction and restoration practices that would maintain the status of properties enrolled in these programs.

A landowner expressed concerns regarding construction impacts on property that is part of a USDA conservation program and benefits wildlife. Because it is possible that additional conservation easements may be identified that are crossed by the MIDSHIP Project, including those that benefit wildlife, we **recommend that:**

- **Prior to construction, Midship Pipeline should file with the Secretary, for review and written approval by the Director of OEP, an updated list of properties crossed by the MIDSHIP Project that are enrolled in NRCS, FSA, or other conservation programs, including any proposed mitigation measures Midship Pipeline would implement to maintain the status of properties enrolled in these programs based on its consultation with the landowner(s) and the administering agency(ies).**

4.8.5 Public Land, Recreation, and Other Special Interest Areas

USGS topographic maps; aerial photographs; correspondence with federal, state, and local agencies; field reconnaissance; and internet searches were used to identify public lands, parks, recreation areas, scenic areas, and other designated or special interest areas at the federal, state, and local level in the vicinity of the proposed MIDSHIP Project facilities.

4.8.5.1 Commissioners of the Land Office Lands

The role of the Commissioners of the Land Office (CLO) was established by the U.S. Congress in the Organic Act of 1890 and the Oklahoma Enabling Act. This legislation reserved certain sections of each township in Oklahoma to be held in trust for the use and benefit of the common schools, and additional sections for state higher education institutions. The CLO are constitutionally charged to manage these assets for the benefit and support of public education. The legislation also set aside an additional section in each township to support public buildings and corrections; however, the money earned from this land is not held in trust, but is disbursed on an annual basis.

Land managed by the CLO is leased for minerals, agriculture, commercial property, special uses (wind farms, hunting, sand and gravel mining, and recreation), easements for oil and gas pipelines, salt water lines, electrical transmission lines, roads, and conservation. The MIDSHIP Project pipelines would cross about 18.9 miles of lands managed by the CLO as State Resource Management Areas (see table 4.8.5-1).

Midship Pipeline would submit an application to the CLO Real Estate Management Division in the first quarter of 2018 for issuance of land easements for the temporary construction right-of-way and the permanent pipeline easement. Permanent rights-of-way on CLO lands may not exceed 30 feet in width. Midship Pipeline would be required to construct across and restore CLO lands in accordance with the terms of the easement agreements, which are issued for a term of 20 years. Following construction, most existing land uses, with the exception of forested areas, would be allowed to return to their previous state.

TABLE 4.8.5-1

Commissioners of the Land Office Lands Crossed by the MIDSHIP Project

Facility/County [a]	Enter Milepost	Crossing Length (miles)	Land Affected During Construction [b] (acres)	Land Affected During Operation [c] (acres)	Predominant Land Use
Mainline					
Kingfisher	13.3	0.7	9.7	4.1	Agriculture
Grady	50	0.4	6	2.6	Agriculture
	58	0.4	5.8	2.4	Agriculture
	58.5	1.7	23.8	10.8	Agriculture and open land
Johnston	152.1	1.9	29.8	12.3	Open land
	163.9	1	13.1	5.9	Open land
	165.1	1.2	14.2	7	Open land
	167.1	0.3	3.3	1.6	Open land
	169.6	1.2	17.4	7.6	Forest
Bryan	172.1	1	14.4	6.3	Forest
	173.6	1.1	16	6.4	Open land and trees
	175.1	2.8	35.7	16.8	Open land
	182.2	1.2	15.4	7.1	Open land
	187.1	1.2	15.7	7.3	Open land
	195.4	1.5	20.7	9.4	Open land and forest
Chisholm Lateral					
Kingfisher	CH0.0	0.1	1.8	0.8	Developed (gas plant)
	CH5.2	1.1	14.8	6.4	Agriculture
TOTAL		**18.9**	**257.6**	**114.4**	

[a] No CLO lands would be crossed by the Velma Lateral or affected by the aboveground facilities.
[b] Construction impacts include the area within the permanent right-of-way and the temporary workspace.
[c] Operational impacts would be associated with maintenance of the permanent right-of-way.

4.8.5.2 Recreation and Special Interest Areas

Based on consultations with local agencies, review of public databases and maps, and field reconnaissance, the MIDSHIP Project would cross or be within 0.25 mile of three areas that support recreation or special interests:

- Historic Route 66: a scenic highway crossed by the Mainline at about MP 15.7;
- the Texoma/Washita Arm of the Tishomingo WMA: about 0.2 mile south of the Mainline at about MP 146.0; and
- the Blue River: an NRI-listed river crossed by the Mainline at MP 174.0.

These areas are discussed in more detail below.

The MIDSHIP Project would not cross or be within 0.25 mile of any NWRs, National Fish Hatchery System lands, The Nature Conservancy Conservation Easements, or other WMAs. In addition, no other special land uses, such as scenic rivers or other public land associated with schools, parks, places

of worship, cemeteries, sports facilities, campgrounds, golf courses, and/or ball fields, would be affected by the MIDSHIP Project.

Historic Route 66

The MIDSHIP Project would cross Historic Route 66 (Interstate 40), also known as the Mother Road, Main Street of America, and Will Rogers Highway, near Mainline MP 15.7 in Canadian County. Commissioned as part of the national highway system in 1926, Route 66 ran from Chicago, Illinois to Los Angeles (and later Santa Monica), California (Oklahoma Department of Transportation, 2017; National Historic Route 66 Federation, 2017). Oklahoma is home to nearly 400 of the 2,400 miles of Historic Route 66. The MIDSHIP Project would cross Historic Route 66 in an area of open agricultural fields. Midship Pipeline would avoid direct impacts on the historic highway by installing the pipeline beneath it using the HDD construction method. Scenic travelers would experience temporary visual and noise impacts associated with construction personnel and equipment, and vegetation removal associated with temporary workspaces; however, recreational uses of the scenic byway would be allowed to continue throughout construction and operation of the project. Visual impacts on users of the scenic byway are discussed in section 4.8.8.

Texoma/Washita Arm of the Tishomingo Wildlife Management Area

The MIDSHIP Project would pass about 0.2 mile north of the Texoma/Washita Arm of the Tishomingo WMA in an area of mixed open land and forest near Mainline MP 146.0 in Johnston County. The Texoma/Washita Arm of the Tishomingo WMA, which is cooperatively managed by the ODWC and the FWS, covers nearly 3,300 acres of land southwest of Tishomingo in southern Johnston County (ODWC, 2017e). The WMA offers primitive camping, a 100-yard shooting range, and game species hunting. Game species of interest include but are not limited to deer, quail, rabbit, turkey, and various waterfowl and furbearers (LASR.NET, 2017). The proposed pipeline would be installed in an area of open land mostly surrounded by forested areas. Based on the distance between the MIDSHIP Project and the Texoma/Washita Arm of the Tishomingo WMA, no direct impacts on the WMA would occur during construction or operation of the project. Construction equipment and vegetation clearing may be visible to WMA visitors from a distance when not obscured by forested areas, but these impacts would be short-term and limited to the period of active construction.

Blue River

Midship Pipeline proposes to cross the NRI-listed Blue River via the HDD construction technique in a forested area at Mainline MP 174.0 in Bryan County. The NRI is a register of river segments that potentially qualify as national wild, scenic, or recreational river areas (see section 4.3.2.4 for more information). This segment of the Blue River is included on the NRI due to its location along the migration route of the federally endangered whooping crane (see section 4.7.1.5), because it is a potential component of the State Scenic Rivers System, and because it is characterized as the most scenic stream in this section of the state (NPS, 2017c). Recreational activities associated with the Blue River include fishing, camping, kayaking, swimming, and semi-annual trout derbies held by the Blue River Association (over Veteran's Day weekend in November and President's Day weekend in February) (Chickasaw Country, 2017; OutdoorsOK, 2017).

Direct impacts on the Blue River and adjacent forested areas would be avoided or minimized because the HDD entry and exit sites would be set back over 700 feet from the river's edge, and clearing of the forested areas between the entry and exit sites would be avoided. Midship Pipeline would conduct limited hand clearing of vegetation as needed to facilitate placement of the electric guide wires that would be used to track the progress of the drilling operation and/or for rubber tired vehicles to carry hoses or

pumps to access approved water sources. A temporary increase in noise levels due to the HDD crossing would occur, which could temporarily reduce enjoyment of recreational activities in the immediate vicinity of the HDD crossing site (see section 4.11.2.2 for additional information regarding noise impacts and mitigation). However, these impacts would be short-term and limited to the period of active construction (i.e., drilling activities). Therefore, we conclude that operation of the project would have minimal to no effect on the recreational uses of the Blue River.

4.8.6 Coastal Zone Management Act

The proposed MIDSHIP Project facilities would not be within coastal zones; therefore, the project would not be subject to a federal Coastal Zone Consistency Review.

4.8.7 Contaminated Sites

As described in sections 4.2.2.6 and 4.3.1.6, a review of ODEQ and EPA databases identified one federal brownfield site 0.25 mile southwest of access road 70 and 0.4 mile southwest of Mainline MP 101.6; however, the EPA conducted a Phase I assessment at the site in 2013 and determined that no contamination risks are present (EPA, 2017a, 2017b; ODEQ, 2017). Therefore, no known soil contamination from this site would be encountered during construction of the project. See sections 4.2.2.6 and 4.3.1.6 for more information regarding procedures Midship Pipeline would implement in the event that unanticipated contamination is discovered during construction of the MIDSHIP Project.

4.8.8 Visual Resources

4.8.8.1 Pipeline Facilities

Visual resources along the proposed pipeline routes are a function of geology, climate, and historical processes, and include topographic relief, vegetation, water, wildlife, land use, and human uses and development. About 54 percent of the MIDSHIP Project pipeline facilities would be collocated with or installed adjacent to existing rights-of-way. As a result, the visual resources along these portions of the project have been previously affected by other similar activities, limiting the change in the visual setting that would result from construction and restoration of the MIDSHIP Project pipeline work areas.

The typical construction and permanent right-of-way widths are described in detail in sections 2.2.2 and 4.8.1.2; however, actual right-of-way configurations and widths would vary based on site-specific conditions including road, railroad, waterbody, and wetland crossings; the need for additional spoil storage; the presence or absence of an existing right-of-way; proximity to adjacent utilities; and use of specialized construction techniques (e.g., HDD).

During construction, the presence of personnel, equipment, and vehicles would be visible in areas accessible to the public such as roadways and nearby residences or businesses. These impacts would be short-term and localized as construction activities move along the right-of-way.

Visual impacts associated with the construction right-of-way and extra workspaces would include the removal of existing vegetation and the exposure of bare soils, as well as earthwork and temporary grading scars associated with heavy equipment tracks. Other visual effects could result from the removal of large individual trees that have intrinsic aesthetic value; the removal or alteration of vegetation that may currently provide a visual barrier; or changes that introduce contrasts in visual scale, spatial characteristics, form, line, color, or texture.

Visual impacts would be greatest where the pipeline route parallels or crosses roads and the pipeline right-of-way may be seen by passing motorists; from residences where vegetation used for visual screening or for ornamental value is removed; and where the pipeline is routed through forested areas. The duration of visual impacts following construction would depend on the type of vegetation that is cleared or altered. The duration of impact from clearing would be shortest in open areas where the reestablishment of vegetation following construction would be relatively rapid. About 85 percent of the land crossed by the proposed pipelines is classified as non-forested, with the predominant land use (open land) accounting for over half of the land crossed. Visual impacts associated with pipeline construction in open land along the route would be temporary and include the presence of equipment during the construction period as well as post-construction visual scarring. Any visual scarring would be evident until vegetation is allowed to regrow. After new vegetation grows, the visual impact of pipeline construction would be minor, but the visual evidence of construction may last for a few years until vegetation productivity on the right-of-way matches the adjacent off right-of-way areas.

The duration of visual impacts would be greater in forested land, which comprises about 15 percent of the lands crossed. After construction, all disturbed areas, including forested areas, would be restored in compliance with the Plan and Procedures; federal, state, and local permits; landowner agreements; and easement requirements. Generally this would include seeding the restored areas with grasses and other herbaceous vegetation, after which trees would be allowed to regenerate within the temporary workspaces. The visual effects on forested areas would be permanent on the maintained right-of-way where the regrowth of trees would not be allowed, and would be long-term, lasting several years, in the temporary workspaces. The greatest potential visual effect would result from the removal of large specimen trees, but even the visual effects of removing smaller trees would last for several years.

Visual effects are also often associated with recreation areas and trails that are valued for their scenic quality. The Mainline would cross Historic Route 66 (Interstate 40) near MP 15.7 and the NRI-listed Blue River near MP 174.0. Midship Pipeline would cross Historic Route 66 via a 0.3-mile-long HDD, maintaining an over 600-foot setback between the HDD entry/exit sites and the road, in an area dominated by agricultural fields and open land. Therefore, impacts on the existing visual setting would be limited to distant views of the pipeline right-of-way. Midship Pipeline would also cross the Blue River via the HDD method, maintaining an over 700-foot setback between the HDD entry/exit sites and the river's edge. Because direct impacts on the river and adjacent forested areas would be avoided or minimized by use of the HDD construction technique, construction and operation of the project would have minimal effect on the scenic uses of the Blue River. No WMAs, refuges, parks, scenic rivers, or other recreational areas valued for scenic qualities would be crossed by the pipeline facilities.

4.8.8.2 Aboveground Facilities

Compressor and Booster Stations

Compressor stations typically consist of multiple buildings, aboveground metering and piping, MLVs, and launchers/receivers. Portions of the sites may be paved, graveled, or landscaped. The proposed booster station would be similar in design but at a much smaller scale. The following mitigation measures would be employed to minimize the visibility at the new compressor stations:

- Outdoor lighting would be limited to the minimum amount required for security during unmanned nighttime operation, while maintaining Occupational Safety and Health Administration safety standards for lighting.

- The main gates, yards, and building entry and exit doors would have lighting for security; however, these lights would have directional control or would be positioned in a manner that minimizes their visibility in areas outside of the facility fenceline.

- The color of the compressor station structures would be non-reflective, basic shades from a low-contrast palette.

The Calumet Compressor Station would be within a rural setting dominated by open and agricultural land surrounded by interspersed forest patches along riparian corridors. There are five rural residences within 1.0 mile of the station, including one to the north, one to the west, one to the southwest, and two to the east. The nearest residence is about 2,200 feet to the southwest of the facility. Direct views of the station from the residences would be limited by the presence of existing vegetation, and the proposed station would be immediately adjacent to and south of an existing gas facility.

The Tatums Compressor Station would be within a rural setting dominated by forest and open land (grassland). There are scattered rural residences within 1.0 mile of the compressor station to the southeast and west, the nearest of which is about 3,900 feet to the west. Existing forested land surrounding most of the compressor station would limit views from nearby residences. We received comments from nearby residents regarding the visibility of the proposed compressor station from their property. In its responses to comments, Midship Pipeline stated that field investigations confirmed the station would not be visible from the commentors' property. Based on aerial photography of the site, we agree that the surrounding forested areas should provide sufficient visual screening of the compressor station from nearby residences. Therefore, we conclude that no significant visual impacts would occur due to the construction and operation of the station.

The Bennington Compressor Station would be within an area dominated by open land (grassland) interspersed with trees along riparian corridors. The closest residence would be about 1,700 feet to the southwest of the compressor station. Multiple other residences are within 1.0 mile to the west, north, and east. Intervening vegetation and trees would partially limit views of the compressor station; however, portions of the station may be visible from these residences. In response to a recommendation in the draft EIS, Midship Pipeline conducted a visual assessment and prepared a Landscape Management Plan for the Bennington Compressor Station. The Landscape Management Plan includes detailed plans for visually screening the compressor station from the nearest residence using a combination of deciduous, evergreen, ornamental trees, and native grasses. We have reviewed the Landscape Management Plan and find it acceptable.

The Sholem Booster Station would be within an area dominated by land developed for natural gas production, interspersed with forested areas and open land. There are no residences within the viewshed of this facility; therefore, no visual impacts would occur.

Meter Stations

Meter stations are much smaller in scale than compressor stations, and typically comprise a small building, communication antenna, and aboveground valves. The Chisholm, Okarche/Mark West, Canadian Valley, Cana, and Iron Horse Meter Stations would be within a landscape dominated by agricultural land adjacent to existing gas production facilities. The Velma and Grady Meter Stations would be within a landscape dominated by open land currently used for gas processing and production wells. The NGPL 801 and Bennington Meter Stations would be within landscapes dominated by agricultural land and open grasslands, respectively. The NGPL Meter Station would be entirely housed within the Bennington Compressor Station site (see Bennington Compressor Station description of potential visual impacts). Because the small size of the meter stations would generally be visually unobtrusive and the Chisholm,

Okarche/Mark West, Canadian Valley, Cana, Velma, and Grady Meter Stations are within areas already dominated by gas production facilities, the meter stations would not have a significant impact on the overall visual character of the area.

Contractor Yards

Midship Pipeline would use the Chickasha Yard, Yukon Yard, and Ardmore Yard for contractor office trailer staging, vehicle parking, and storage of equipment and materials needed for construction. These activities would be visible to local residents and passers-by, but the visual impacts would be limited to the period of active construction and the land would be returned to preconstruction conditions. Use of the yards would temporarily occupy areas dominated by agricultural land. We conclude that impacts on visual resources associated with the contractor yards would be minor and limited to the period of active construction.

Access Roads

As described in sections 2.2.6 and 4.8.1.5, Midship Pipeline proposes to use 116 access roads to construct the project. Of these 116 roads, 25 roads would be permanently maintained for operations and the remaining 91 would be restored to preconstruction conditions following completion of the project, subject to landowner approval. Because the majority of the access roads are existing or partially existing and construction of the new access road areas (including all of the new permanent access roads) would occur primarily in agricultural land or grassy fields, impacts on visual resources would be short-term and limited primarily to the period of active construction.

4.9 SOCIOECONOMICS

Construction and operation of the MIDSHIP Project could affect socioeconomic conditions in the vicinity of the project. Potential impacts during construction include a temporary increase in population, increased employment opportunities, increased demand for housing and public services, transportation impacts, and an increase in government revenue associated with sales and payroll taxes. Potential beneficial socioeconomic impacts of project operation include employment opportunities, ongoing local expenditures by Midship Pipeline, and an increased tax base.

4.9.1 Socioeconomic Study Area

The socioeconomic study area that we considered for this analysis includes the eight counties in which the proposed MIDSHIP Project facilities would be located:

- Kingfisher County;
- Canadian County;
- Grady County;
- Garvin County;
- Stephens County;
- Carter County;
- Johnston County; and
- Bryan County.

Because workers may travel outside of directly affected communities to obtain temporary housing, food, and services, Midship Pipeline also considered potential impacts on communities within a 30-minute driving distance of project facilities, which Midship Pipeline determined to include the communities within 18 miles of the proposed pipeline and major aboveground facilities. Some of these communities could be

reasonably expected to experience impacts during the project's construction period, such as increases in traffic, increases in demand for lodging and services, and an increase in local business sales. Therefore, where applicable, potential impacts on these other communities are also considered in our analysis.

4.9.2 Population and Employment

Table 4.9.2-1 presents population data, per capita incomes, civilian workforce numbers, unemployment rates, and the leading three industries for the counties that would be affected by the project and for the State of Oklahoma. Based on 2015 population estimates, the combined population of the eight counties in the project area totals 370,835 people (U.S. Census Bureau, 2015a). Population density in the affected counties ranges considerably, from lows of 16.7 and 16.9 persons per square mile in Johnston and Kingfisher Counties, respectively, to a high of 139.3 persons per square mile in Canadian County, which includes a portion of Oklahoma City. Except for Canadian and Carter Counties, which include several small cities and towns, each of the counties in the study area has a population density that is lower than the population density of the State of Oklahoma.

TABLE 4.9.2-1

Existing Economic Conditions in the MIDSHIP Project Area

State/County	2015 Population (Estimate)[a]	Population Density (persons/ sq. mi.)[b]	Per Capita Income ($US dollars)[c]	Civilian Labor Force Unemployment Rate (percent)[d]	Civilian Workforce[d]	Top Three Industries[e]
State of Oklahoma	3,849,733	55.1	$25,032	6.3	1,854,061	
Kingfisher	15,302	16.9	$27,733	3.6	7,563	Ag, E, M
Canadian	126,193	139.3	$28,246	4.5	65,993	E, R, P
Grady	53,612	48.5	$24,965	4.3	25,170	E, R, M
Garvin	27,455	33.7	$21,644	4.4	11,164	E, R, Ag
Stephens	44,808	50.3	$24,291	6.6	20,365	E, Ag, R
Carter	48,442	58.1	$22,870	6.1	22,165	E, M, R
Johnston	11,022	16.7	$20,425	6.7	4,371	E, M, R
Bryan	44,003	46.6	$20,668	8.1	20,101	E, A, R

[a] U.S. Census Bureau, 2015a. 2011–2015 American Community Survey 5-year Estimates: B01003.
[b] Calculated based on areas in U.S. Census Bureau, 2010.
[c] U.S. Census Bureau, 2015b.
[d] U.S. Census Bureau, 2015c.
[e] U.S. Census Bureau, 2015d.
Industry Key:
A = Arts, entertainment, recreation, and accommodation and food services
Ag = Agriculture, forestry, fishing and hunting, and mining
E = Educational, health, and social services
M = Manufacturing
P = Professional, scientific, management, administrative, and waste management services
R = Retail trade

Oklahoma City is the largest population center in the area, and the Oklahoma City metropolitan statistical area (MSA) is the only MSA within the study area. The U.S. Census Bureau defines an MSA as containing a core urban area with a population greater than or equal to 50,000, as well as all or parts of one or more counties that have a high degree of social and economic integration (as measured by commuting to work) with the urban core. The Oklahoma City MSA includes Canadian and Grady Counties, which are within the study area, and Cleveland, Lincoln, Logan, McClain, and Oklahoma Counties, which are outside of the study area. According to U.S. Census Bureau estimates, the 2015 population of the Oklahoma City MSA was about 1,356,965 or about 35 percent of the state's total population (U.S. Census Bureau, 2017).

The total civilian workforce in the study area totals 176,892. The average per capita incomes in these counties range from $20,425 to $28,246, compared to the Oklahoma average of $25,032. Unemployment rates within the potentially affected counties range from 3.6 to 8.1 percent, compared to the state average of 6.3 percent. The major occupations in the project area are in the fields of educational, health, and social services; manufacturing; and retail trade. Agriculture is also an important sector in a few counties.

Oklahoma City provides a large workforce in relatively close proximity to the project facilities. Oklahoma City's overall civilian labor force includes 309,271 workers, while the entire Oklahoma City MSA has a civilian labor force of 662,421 workers (U.S. Census Bureau, 2015c).

Construction of the project would temporarily increase the population in the affected counties and possibly some of the other nearby communities. Table 4.9.2-2 presents the estimated construction workforce and payroll for the project facilities. Workforce numbers would vary depending on the activity, but would average about 723 workers at any one time during construction. The peak construction workforce across all project components would total about 1,338 workers, including about 800 workers for the pipeline facilities and 538 workers for the compressor stations, booster station, and meter stations. Midship Pipeline estimates that 65 percent of the peak workforce, or 872 workers, would be hired locally, while the remaining 35 percent (466 workers) would temporarily relocate to the project area. The peak and average workforce represent less than 1 percent of the total workforce in the study area. As a result, although the project would temporarily increase employment, we find that the effect of the temporary positions on the unemployment rates or labor availability in the project area would be small but positive.

Construction personnel hired from outside of the project area may include supervisory personnel and inspectors, operators for equipment and cranes, special trade craft workers, purchasing agents, office managers, land agents, project engineers, surveyors, millwrights, electricians, various specialty operators (including welders), and line locators. These individuals would temporarily relocate to the project vicinity. Based on its experience with other projects and the relatively short duration of construction activities, Midship Pipeline anticipates that few, if any, of the non-local construction workers would be accompanied by their families. The U.S. Census Bureau reports that the average household size in 2016 was 2.5 people (U.S. Census Bureau, 2016). Therefore, even if all 466 of the anticipated non-local workers brought their families, the population in the project area would only increase by 1,165 people. Given the population of the project area (about 370,835) and distribution of the construction workforce, the addition of 1,165 people during the 9-month construction period would not result in a significant change in population.

Midship Pipeline anticipates hiring staff to fill 12 to 14 new full time equivalent operations and maintenance positions, with 70 to 80 percent of these positions being filled by workers from the project area counties. The effect of these permanent positions on the unemployment rates in the project area is expected to be small but positive.

TABLE 4.9.2-2

Summary of Construction and Operational Workforce and Estimated Payroll for the MIDSHIP Project

Facility/County	Average Workforce	Peak Workforce [a]	Peak Workforce Hired Locally	Estimated Payroll ($1,000)	Construction Duration (months)
PIPELINE					
Construction					
Kingfisher County: Mainline and Chisholm Lateral [b]	200	400	260	$6,367	0.9
Canadian County: Mainline and Tie-in Piping [b]	200	400	260	$8,540	1.1
Grady County: Mainline	200	400	260	$15,213	1.9
Garvin County: Mainline and Velma Lateral [b]	200	400	260	$5,938	0.7
Stephens County: Mainline and Velma Lateral [b]	200	400	260	$3,857	0.5
Carter County: Mainline and Velma Lateral [b]	200	400	260	$12,765	1.6
Johnston County: Mainline	200	400	260	$9,612	1.2
Bryan County: Mainline	200	400	260	$9,061	1.1
Pipeline Subtotal	400 [c]	800 [d]	520 [e]	$71,353	9.0
ABOVEGROUND FACILITIES					
Construction [f]					
Calumet Compressor Station	44	88	57	$6,000	9.0 [g]
Tatums Compressor Station	44	88	57	$6,000	9.0 [g]
Bennington Compressor Station	44	88	57	$6,000	9.0 [g]
Sholem Booster Station	30	50	33	$2,000	5.0 [g]
Chisholm Meter Station	12	18	12	$480	3.5 [g]
Okarche/Mark West Meter Station	24	36	24	$960	3.5 [g]
Canadian Valley Meter Station	12	18	12	$480	3.5 [g]
Cana Meter Station	12	18	12	$480	3.5 [g]
Iron Horse Meter Station	12	18	12	$600	3.5 [g]
Grady Meter Station	12	18	12	$600	3.5 [g]
Velma Meter Station	12	18	12	$480	3.5 [g]
NGPL 801 Meter Station	13	20	13	$530	3.5 [g]
NGPL Meter Station	13	20	13	$530	3.5 [g]
Bennington Meter Station	27	40	26	$1,860	3.5 [g]
Aboveground Facilities Subtotal	311	538	352	$27,000	9.0
Operations [h]	12–14	–	–	$1,600	–
PROJECT TOTAL	723–725	1,338	872	$99,953	9.0

[a] Peak construction workforce would occur when peak construction activities happen within one county as construction progresses along the project in two construction spreads.
[b] Construction of the Chisholm and Velma Laterals would take about 3 months each; construction of the Tie-in Piping would take less than 1 month.
[c] Assumes 200 per spread.
[d] Assumes 400 per spread.
[e] Assumes 260 per spread.
[f] All of the receipt taps would be constructed concurrently with the Mainline and/or Chisholm and Velma Laterals and, therefore, the required workforce is accounted for under the pipeline facilities.
[g] Includes site preparation.
[h] Includes pipeline and aboveground facility operations personnel.

4.9.3 Housing

Housing statistics for the study area are provided in table 4.9.3-1. Based on U.S. Census Bureau data, 4,552 hotel and motel rooms, 2,121 recreational vehicle (RV) campsites, and more than 36,900 rental housing units are located in the project counties. Rental vacancy rates in the study area range from 4.5 to 15.6 percent. Additional hotels, motels, campgrounds, and rental units are located in the incorporated towns and cities within 18 miles of the project, as well as in the Oklahoma City MSA. Midship Pipeline found that rental vacancy rates in individual communities outside of the project counties but within 18 miles of the project facilities range from 0 to 28.6 percent, with the highest vacancy rates typically found in smaller communities. Hotel and motel rooms and RV campsites are generally found in larger communities.

TABLE 4.9.3-1

Available Housing in the MIDSHIP Project Study Area

Location	Total Housing Units [a]	Owner Occupied Housing Units [a]	Renter Occupied Housing Units [a]	Rental Vacancy Rate [a,b] (percent)	Median Rent ($ monthly) [a]	Vacant Housing Units [c]	Hotel/ Motel Rooms [d,e]	RV Hook-ups [d,f]
State of Oklahoma	**1,689,427**	**961,384**	**493,937**	**8.1**	**727**	**234,106**	**–**	**–**
Project Counties								
Kingfisher County	6,454	4,384	1,357	5.0	708	713	46	29
Canadian County	46,753	33,128	9,935	4.5	886	3,690	1,187	249
Grady County	22,437	14,860	4,729	6.5	663	2,848	542	163
Garvin County	12,815	7,310	3,221	8.0	598	2,284	364	172
Stephens County	20,682	12,567	5,301	6.0	649	2,814	411	543
Carter County	21,408	12,493	5,374	15.6	676	3,541	1,506	662
Johnston County	5,136	3,026	1,138	7.9	579	972	Unknown	--
Bryan County	19,826	10,749	5,883	8.9	666	3,194	496	303
Study Area Total	**155,511**	**98,517**	**36,938**	**–**	**–**	**20,056**	**4,552**	**2,121**

[a] U.S. Census Bureau, 2015e.
[b] Rental vacancy is the proportion of the rental inventory which is vacant for rent.
[c] U.S. Census Bureau, 2015f.
[d] Number of hotels, motels, RV parks, and campgrounds was compiled for an approximate 18-mile distance on either side of the project centerline.
[e] Hotels.com, 2016 and 2017; Google Earth, 2016 and 2017.
[f] RV Parks Review, 2016 and 2017; Google Earth, 2016 and 2017.

As stated in section 4.9.2, Midship Pipeline estimates that approximately 35 percent of the workforce would be non-local and that, at peak construction, about 466 non-local workers would seek temporary housing in the project area. This represents less than 1 percent of the total temporary housing (rental housing, hotel and motel rooms, and RV hookups) available in the study area.

Increased temporary housing demand would benefit landlords and the proprietors of local motels, hotels, and other rental units through increased revenue. Although individual facilities or communities may experience short-term reductions in available temporary housing, the influx of non-local workers is not expected to increase the overall cost of short-term housing or reduce overall housing or lodging availability for tourists, recreationalists, and local renters or residents. As a result, we have determined that existing

temporary housing would be sufficient to house the non-local construction workforce without significantly affecting or displacing tourists, local renters, or residents.

The estimated 12 to 14 new permanent employees would not have any discernable effect on housing demand in the project area.

4.9.4 Public Services

The project area is served by a wide range of public services and facilities, including hospitals, full-service law enforcement, career and volunteer fire departments, and schools. Table 4.9.4-1 provides an overview of select public services available by county within the study area.

TABLE 4.9.4-1

Public Services Available in the MIDSHIP Project Study Area

	Number of Facilities				Distance from Project Mainline to Nearest Public Service (miles)		
County	Fire Stations [a]	Hospitals and Medical Facilities (Beds) [b]	Police/ Sheriff Departments [c]	Public Schools [d]	Fire Stations	Hospitals and Medical Facilities	Police/ Sheriff Departments
Kingfisher County	8	1 (25)	5	16	4.3	3.5	4.2
Canadian County	16	2 (123)	8	47	0.9	6.8	0.9
Grady County	25	1 (49)	9	32	0.8	8.7	0.8
Garvin County	11	2 (90)	8	22	0.8	4.6	5.6
Stephens County	16	1 (121)	5	26	0.9	16.9	1.0
Carter County	18	2 (202)	7	28	0.1	7.2	3.5
Johnston County	13	1 (25)	2	13	1.3	2.2	1.5
Bryan County	24	1 (148)	8	23	0.9	8.2	1.1
Total	131	11 (783)	52	207	–	–	–

[a] U.S. Fire Administration, 2016; FireDepartment.net, 2016; USGS, 2016.
[b] American Hospital Directory, 2016; USGS, 2016; Mercy Hospital Healdton, 2016; Mercy Hospital Kingfisher, 2016; Mercy Hospital Tishomingo, 2016.
[c] USACops, 2016; PoliceOne, 2016; USGS, 2016.
[d] National Center for Education Statistics, 2016; University of Oklahoma, 2016.

A total of 11 hospitals serve the study area counties, with 1 to 2 hospitals per county; additional medical facilities are available in the larger Oklahoma City MSA. Law enforcement, fire protection, and emergency medical services are provided in each county through a network of inter-local agreements. As shown in table 4.9.4-1, there are 52 police departments and sheriff's offices in the study area. Many incorporated municipalities operate a police department, while county sheriffs' offices serve unincorporated portions of the county. The Oklahoma Highway Patrol provides additional services. Most of the counties are served by a mix of volunteer and paid firefighters. There are 131 fire stations in the study area. Most of the counties and communities have an emergency management plan, a hazard mitigation plan, or a community wildfire protection plan that addresses the capabilities of firefighting resources in each county and community. Interagency coordination is provided by the Southern Area Coordination Center and the Arkansas-Oklahoma Interagency Coordination Center (Southern Area Coordination Center, 2017). The number of public schools ranges from 13 in Johnston County to 47 in Canadian County, for a total of 207 public schools in the study area.

Temporary increased demand on local public services may occur during construction, including the need for local police to direct traffic at road crossings or to respond to emergencies associated with project construction. Fire departments may have to respond to project-related fires or other emergencies, and medical services may be necessary for workforce personnel illnesses or injuries. Impacts on medical facilities could include injuries or illnesses that may occur to construction workers. According to the U.S. Bureau of Labor Statistics, the number of recordable injuries and illnesses for the oil and gas pipeline construction industry is about 0.8 per 100 full-time workers (U.S. Bureau of Labor Statistics, 2015). Therefore, any project-related increase in demand for medical facility services would not be expected to exceed the capacity or level of service provided by existing medical facilities in the project area.

Midship Pipeline would require its construction contractor to develop and implement a project-specific safety plan in accordance with federal safety requirements. As discussed in more detail in section 4.12.1, Midship Pipeline would work with local law enforcement, fire departments, emergency medical services, and hospitals prior to construction to coordinate for effective emergency response, including emergency response in remote areas.

Few, if any, non-local construction workers are expected to bring school-aged children to the project area. As a result, the project would have negligible impacts on primary and secondary schools and that any increases in enrollment would be temporary.

Based on the number of police and fire stations, schools, and hospitals, we conclude there is adequate public service infrastructure in the project area to accommodate the temporary needs of the approximately 466 non-local construction workers who may relocate to the project area during construction. The project's operation and maintenance activities, including the 12 to 14 new permanent employees, would have a negligible impact on existing public infrastructure and community services.

4.9.5 Transportation and Traffic

Interstate highways and other major roads connect the cities and towns in the project area and neighboring counties. These major roads are supplemented by an extensive network of other state, county, and local roadways; freight and passenger railways; and public and private airports. Public transportation in the project area also provide service to both urban and rural areas.

Regional access to the project area would generally be from interstates, state and county highways, county roads, and private roads.

During construction, the project area would experience a temporary increase in vehicle traffic due to construction workforce commuting patterns, the movement of construction vehicles, and the delivery of equipment and materials to the construction work areas at work area entry/exit points. Additional impacts on transportation and traffic would result from construction across roadways and railroads; however, impacts would be minimal because all railroads and major roads would be bored.

Midship Pipeline estimates that, during pipeline construction, commuting by the construction workforce would result in up to two round trips per day by about 420 commuter vehicles per pipeline spread. Workers would either provide their own transportation or be provided transportation by the construction contractor. Additionally, pipeline construction would require an estimated 100 to 200 truck trips per day per spread for delivery of material and equipment. While the movement of vehicles and equipment associated with pipeline construction would increase local traffic flows, this would be a temporary and relatively minor impact at any given location given the size of the construction workforce and the movement of the construction spreads' activities along the route. Additionally, commuting traffic

associated with pipeline construction would typically take place before 7 a.m. and after 7 p.m. (i.e., not during the typical morning and afternoon peak hours for local traffic).

Midship Pipeline estimates that average daily traffic for compressor station construction would include but not be limited to:

- 70 passenger vehicle round trips per day for the construction workforce;
- 5 to 10 one-ton pickup truck round trips per day for fuel and supply delivery;
- 5 round trips per day (5 days per week) for subcontractor deliveries;
- up to 5 trips per day by vehicles hauling in materials and hauling out waste;
- up to 70 total truck round trips during the first two months of compressor station construction for delivery of large compressor station equipment; and
- additional unscheduled trips (e.g., plumber, security company, utility company visits).

Specific traffic estimates are not available for booster station construction; however, based on data provided by Midship Pipeline, booster station construction would generate about half as many trips as typical compressor station construction.

Table 4.9.5-1 provides an estimate of traffic impacts associated with construction of the aboveground facilities based on a comparison of the estimated number of project workers to the number of resident workers in the census tracts affected by each aboveground facility. The traffic volumes on the nearest major road (leading to the smaller roads used to reach each facility) are provided for reference. As indicated in the table, the addition of construction worker traffic for compressor/booster station construction would temporarily increase work-related commuter traffic by about 4.7 to 9.7 percent. In addition, traffic congestion could occur at the compressor/booster station construction entrances during and throughout construction.

TABLE 4.9.5-1

Summary of Traffic Volume Impacts Associated with MIDSHIP Project Compressor and Booster Station Construction

Facility	Nearest Major Road (vehicles per day) [a]	Census Tract Containing Project Facility [b]	Workers in Census Tract [b]	Daily Vehicle Trips	Project Workers as Percentage of Census Tract Workers (percent)
Calumet Compressor Station	Interstate 40 (26,100 to 26,900)	3001	1,191	90	7.5
Tatums Compressor Station	State Highway 76 (1,700) State Highway 74 (1,100)	6819	1,352	90	6.7
Sholem Booster Station	State Highway 76 (1,700)	10	964	45	4.7
Bennington Compressor Station	State Highway 70E (870)	7956	932	90	9.7

[a] Oklahoma Department of Transportation, 2015a.
[b] U.S. Census Bureau, 2015b.

Public roads used by construction vehicles to travel to and from construction work sites would likely experience increased sediment tracking/build-up at the work area entry/exit locations. In accordance

with our Plan, Midship Pipeline would be required to remove any soil or gravel spilled or tracked onto roadways daily or more frequently as necessary to maintain safe road conditions. Construction vehicles and equipment also have the potential to cause surface damage. Paved roads can generally withstand periodic surges in traffic and heavy use. Unpaved roads, including gravel roads such as those that would provide access to several project sites, may be less durable. Midship Pipeline and its contractors would comply with load limits and other specifications for use of paved and unpaved public roads, including adhering to any applicable permit conditions. In the event that construction traffic causes damage to the roads, Midship Pipeline would make repairs in accordance with the requirements set forth by the landowner or agency having jurisdiction over the road.

Midship Pipeline would install the pipeline under major federal and state highways, and all railroads, using the conventional bore or HDD method, minimizing the potential for disruption to vehicle/railway travel (see section 2.3.2.4 for further details regarding road and railroad crossing methods). Midship Pipeline would cross county roads via conventional bore or by the open-cut method, depending on permit requirements. Private roads would be crossed via the open-cut method and then restored to preconstruction conditions. Midship Pipeline would minimize impacts associated with in-road construction through implementation of traffic control strategies. Appropriate traffic management, signage, and necessary safety measures would be implemented in accordance with applicable permits for work in public roadways. Where needed, Midship Pipeline would coordinate with local officials to have traffic safety personnel present during construction to ensure the safety of the workers and the public. All efforts would be made to maintain at least one traffic lane open during construction, except for brief periods when road closure would be required to install the pipeline. Where needed, Midship Pipeline would install steel plates across the trench and/or would make provisions for temporary detours or other measures to maintain access and safe traffic flow during construction.

Prior to construction, Midship Pipeline would develop a *Traffic Management Plan* to account for traffic flows and ensure the safety of the construction crews and general public. In the draft EIS, we recommended that Midship Pipeline file its *Traffic Management Plan* with the Secretary prior to construction to ensure that appropriate mitigation strategies are implemented to minimize traffic-related impacts, including providing specific information regarding traffic control measures and personnel, emergency access management procedures, off-site vehicle parking areas, alternative worker transportation methods (e.g., bussing to construction worksites), and a communication plan for notifying emergency services personnel, school systems, and the public about the location and duration of road closures. In response to our recommendation, Midship Pipeline committed to filing the plan prior to the start of construction.

Due to the use of conventional bore or HDD construction methods, construction of the MIDSHIP Project is not expected to affect passenger and freight rail operations. No airport facilities are crossed by the project. One private airstrip, Smith Field in Carter County, is within 0.25 mile of the Mainline; however, project activities would not impede public access to or use of this airport (Federal Aviation Administration, 2013).

The main office for operations of the pipeline, Tatums Compressor Station, Velma Lateral, and Sholem Booster Station would be at the Tatums Compressor Station, and would generate an estimated 10 to 14 daily employee round trips. Operation of the Calumet and Bennington Compressor Stations would each generate an estimated 4 to 6 daily employee round trips. These activities would have a negligible impact on traffic.

With implementation of the mitigation measures and methods described in this section and our recommendation, we conclude that construction and operation of the MIDSHIP Project would result in minor and temporary impacts on transportation infrastructure and traffic patterns.

4.9.6 Property Values and Insurance

As described in section 4.8.1.1, the project would affect primarily agricultural and open land. About 98 percent of the land crossed by the pipeline workspace is categorized as open land, agricultural land, or forest. The pipeline workspace would cross 14.0 acres of residential land, which could include rural homesteads and suburban residential lots, and 41.0 acres of developed land, primarily road and rail rights-of-way. The aboveground facilities would affect open land, agricultural land, developed land, and forest. No businesses or residences would be removed or displaced by construction and operation of the project's facilities. Midship Pipeline would avoid disruption or interference with access to businesses or residences to the maximum extent practicable.

As described in section 4.8.2, Midship Pipeline would acquire easements for both the temporary (construction) and permanent rights-of-way and compensate landowners for the easements, any temporary loss of use, and any construction-related damages and loss of crops or marketable timber. Impacts on forestland and agricultural land are described in sections 4.5 and 4.8. We received comments from two landowners expressing concerns about potential damage to water sources on their properties that are essential to grazing and agricultural operations. Midship Pipeline is working with those landowners to resolve their concerns (see section 4.8.4 for additional information).

Land values would be determined by appraisals that take into account objective characteristics of the property such as size, location, and any improvements. The value of a tract of land would be related to many tract-specific variables, including the current value of the land, the utilities and services available or accessible, the current land use, and the values of the adjacent properties. The valuations generally do not consider subjective aspects such as the potential effect of a pipeline. That is not to say that the presence of a pipeline, and the restrictions associated with a pipeline easement, could not influence a potential buyer's decision to purchase a property. If a buyer is looking for a property for a specific use, and the presence of the pipeline renders that use infeasible, then the buyer may decide to purchase another property more suitable to their objectives. For example, a buyer wanting to develop the land for a commercial property with sub-surface structures may not find the property suitable, but a farmer looking for land for grazing or additional cropland could find it suitable for their needs. This would be similar to other buyer-specific preferences that not all properties have, such as close proximity to shopping, relative seclusion, or access to high-quality school districts.

Several studies examined the effects of pipeline easements on sales and property values and evaluated the impact of natural gas pipelines on real estate. One study, *Pipeline Impact Study: Study of a Williams Natural Gas Pipeline on Residential Real Estate: Saddle Ridge Subdivision, Dallas Township, Luzerne County, Pennsylvania* prepared by the firm of Allen, Williford & Seale, Inc., assessed the impact on the sales price of undeveloped lots and single-family residences that have a natural gas transmission line easement on the property (Allen, Williford & Seale, Inc., 2014). The report compared sales of units within a subdivision based on the presence of an existing natural gas transmission line on the property. Differences between the sales prices of undeveloped lots and houses with the pipeline easement and those that did not have an easement were analyzed. The report found that, when the sales prices of the encumbered residences were compared with the sales prices of the unencumbered residences, there was no indication that the pipeline easement had any effect on the sales prices of homes in Saddle Ridge. Likewise, when the sales prices of encumbered lots were compared with the sales prices of unencumbered lots, the differential in price could be explained by the reduction in lot size associated with the easement area.

A study by Integra Realty Resources in 2016 evaluated the impact of gas pipelines on property values in Ohio, Virginia, New Jersey, Pennsylvania, and Mississippi. This study found that the presence of a pipeline does not inhibit house sales and that homes "encumbered" by pipeline easements have an adjusted sales price higher than the average and median sales prices for "unencumbered" homes (Integra Realty Resources, 2016).

In February 2016, INGAA published a study, *Pipeline Impact to Property Value and Property Insurability*, which studied properties in four separate areas of the country in 2015. The findings indicate that the presence of pipelines does not affect the value of a property, its insurability, its desirability, or the ability to obtain a mortgage (INGAA, 2016).

In 2008, PGP Valuation Inc. conducted a study for Palomar Gas Transmission, Inc. and ECONorthwest conducted a study for the Oregon LNG Project (PGP, 2008; Fruits, 2008). Both studies evaluated the potential effect on property values of natural gas pipelines that were constructed in 2003/2004 in northwestern Oregon and along the western edge of the Portland metropolitan area. The PGP study found there was no measurable long-term impact on property values resulting from natural gas pipelines. The ECONorthwest study found that the pipeline had no statistically or economically significant impact on residential properties, and there was no relationship between proximity to the pipeline and sales price.

Diskin, et al. (2011) reached a similar conclusion on the effects of natural gas transmission pipelines on residential values in Arizona. This study concluded that there was no identifiable systematic relationship between proximity to a pipeline and residential sales price or value. Another study conducted by Hansen, et al. (2006) analyzed property sales near a pipeline accident that occurred in Washington and considered the property's proximity and persistence over time. While this study revealed a decline in property values after the accident, it noted that the effect was localized and declined as the distance from the affected pipeline increased. The effect also diminished over time in the years following the incident.

The January/February 2011 edition of the International Right of Way Association publication, *Right of Way*, includes the article *The Effect of Natural Gas Pipelines on Residential Value*. This study did not identify a systematic relationship between proximity to the pipeline and sales price or value (International Right of Way Online, 2011). Additionally, a 2012 study by Gnarus Advisors LLC, examined whether the proximity to pipelines, particularly natural gas pipelines, had an effect on residential property values. The study contained a literature review specific to pipelines and property values, with a focus on actual sales data. The authors concluded that there was "no credible evidence based on actual sales data that proximity to pipelines reduces property values" (Gnarus Advisors LLC, 2012).

Based on the research cited above, as well as research conducted in support of EIS documents for previous projects across the country, we find no conclusive evidence indicating that natural gas pipeline easements would have a significant negative impact on property values. Regarding any potential impacts on mortgage rates associated with pipeline proximity, we are not aware of any practice by mortgage companies to re-categorize properties nor are we aware of federally insured mortgages being revoked based on proximity to pipelines.

In addition to considering potential impacts on property values, FERC has reviewed the potential effects of natural gas projects on homeowner insurance rates in several final EISs for natural gas pipelines and liquefied natural gas terminals. In March 2012, FERC issued its final EIS for the proposed New Jersey – New York Expansion Project (Docket No. CP11-56-000), which addressed the potential for insurance adjustments related to pipeline proximity, and concluded that, "Regarding the potential for insurance premium adjustments associated with pipeline proximity, insurance advisors consulted on other natural gas projects reviewed by FERC indicated that pipeline infrastructure does not affect homeowner insurance rates." As such, we conclude that the construction and operation of the MIDSHIP Project would not adversely affect homeowners' insurance rates or the ability to acquire a homeowner's insurance policy.

4.9.7 Economy and Tax Revenues

Construction and operation of the MIDSHIP Project would have a beneficial impact on the local economy as a result of increased payroll, local materials and services purchased, and utilization of local vendors. Midship Pipeline estimates it would pay a total of $71.4 million for pipeline construction labor

across the eight counties, in addition to an estimated $27.0 million in payroll expenditures for the new aboveground facilities. In addition, local businesses would benefit from demands for goods and services generated by the temporary construction workforce. During construction, the pipeline workforce would spend an estimated $168,000 to $672,000 on housing and meals in each county in the project area.

Midship Pipeline's local expenditures would include the purchase or rental of equipment and materials/ supplies, such as fuel, stone, sand, concrete, and fencing materials. Midship Pipeline estimates that pipeline construction would result in the local purchase of about $19 million in materials and that aboveground facility construction would result in about $8 million in local materials purchases.

Midship Pipeline estimates that project construction would generate $26.4 million in sales tax revenue due to the purchase of local goods and services by project workers. Midship Pipeline and its contractors would also pay sales tax for local material purchases and equipment purchase or rental.

After construction is complete, the new full-time equivalent operations positions would generate minor economic benefits. Midship Pipeline estimates the total annual payroll for the 12 to 14 new positions would be $1.6 million per year. The MIDSHIP Project would generate an additional $70,000 in local materials and services purchases (5 percent of total materials and services purchases) for operations and maintenance activities.

Local communities would benefit from *ad valorem* (property) taxes on the project facilities, which would be paid annually by Midship Pipeline to each of the eight counties in which the facilities would be located. Midship Pipeline estimates that these taxes would range from $2.7 million in 2018 to $19.3 million in 2021, totaling about $181.1 million through 2029. Payroll and sales taxes generated by the operation of the project would result in minor contributions to state tax income.

4.9.8 Environmental Justice

Executive Order 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires federal agencies to identify and address, as appropriate, any disproportionately high and adverse health or environmental effects on federal programs, policies, and activities on minority populations and low income populations. In accordance with Executive Order 12898, the CEQ has called on federal agencies to actively scrutinize the following issues with respect to environmental justice (CEQ, 1997a):

- the racial and economic composition of affected communities;
- health-related issues that may amplify project effects on minority or low-income individuals; and
- public participation strategies, including community or tribal participation in the process.

The EPA's Environmental Justice policies focus on enhancing opportunities for residents to participate in decision making. The EPA (2011) states that environmental justice involves meaningful involvement so that: "(1) potentially affected community residents have an appropriate opportunity to participate in decisions about a proposed activity that will affect their environment and/or health; (2) the public's contributions can influence the regulatory agency's decision; (3) the concerns of all participants involved will be considered in the decision-making process; and (4) the decision-makers seek out and facilitate the involvement of those potentially affected."

As described in section 1.3, there have been many opportunities for the public to comment on and provide input about the project. Public documents, notices, and meetings for the project were made readily available to the public during our review of the project. Midship Pipeline met with many different

stakeholders during the initial development of the route, including local residents and affected landowners. Midship Pipeline also established a project website to share project information with the public, a project email address, and a toll-free project telephone number.

Midship Pipeline used the FERC's pre-filing process (see section 1.3). A primary goal of this process is to encourage public awareness and input regarding every aspect of a project before an application is filed. During the pre-filing process, Midship Pipeline held four open houses, several tribal meetings, and numerous project briefings. FERC staff participated in Midship Pipeline's open houses to receive input from the public about the project and to explain FERC's review process and the opportunities it provides for public input. FERC also noticed and held four scoping sessions to identify concerns and issues that should be covered in the EIS.[16] Each scoping session was documented by a court reporter, and the transcripts were placed into the public record for the project.[17] The scoping sessions were held in Durant, Ardmore, Elmore City, and El Reno between February 13 and 16, 2017. One person commented at the scoping session in Durant, two at the session in Ardmore, two at the session in Elmore City, and one at the session in El Reno. FERC mailed copies of the draft EIS to its environmental stakeholder list (which includes federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Native American Tribes; other interested parties; and local libraries and newspapers. This list also includes all affected landowners (as defined in the Commission's regulations) who are potential right-of-way grantors, whose property may be used temporarily for project purposes, or who own homes within certain distances of aboveground facilities, and anyone who submits comments on the project. The EIS identified four FERC comment sessions to give the public an opportunity to comment on the draft EIS. Each comment session was documented by a court reporter, and the transcripts were placed into the public record for the project.[18] The scoping sessions were held in Durant, Ardmore, Elmore City, and El Reno between March 12 and 15, 2018. Two people commented at the meeting in Durant, one at the meeting in Elmore City, and one at the meeting in El Reno.

In its scoping comments, the EPA recommended that the EIS describe tribal consultations, issues raised (if any), and how those issues were addressed. Section 4.10 discusses tribal concerns and the project's impacts on tribal resources.

Environmental Justice Analysis

Guidance from the CEQ states that "minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis" (CEQ, 1997a). Minority populations are defined as Hispanics, Asian-Americans and Pacific Islanders, African-Americans, and American Indians and Alaskan Natives persons.

For the purposes of this analysis, environmental justice areas are defined as block groups fitting one of the following criteria:

- a minority population that comprises more than 50 percent of the block group population;

[16] The NOI and Supplemental NOI for the Midship Project are available for viewing through eLibrary on the FERC internet website at http://ferc.gov (see accession nos. 20170127-3014 and 20170322-3040).

[17] Transcripts of the public scoping sessions are available for viewing through eLibrary on the FERC internet website at http://ferc.gov (see accession nos. 20170317-4003, 20170317-4004, 20170317-4005, and 20170317-4006).

[18] Transcripts of the public scoping sessions are available for viewing through eLibrary on the FERC internet website at http://ferc.gov (see accession nos. 20180312-4005, 2018-0313-4004, 20180314-4010, and 20180315-4003).

- a minority population at least 10 percentage points (i.e., the difference between two percentages, not the percent change between values) higher than the comparison group in the surrounding county;
- a low-income population that comprises more than 50 percent of the block group population; or
- a low-income population at least 10 percentage points higher than the comparison group in the surrounding county.

The area analyzed for environmental justice impacts includes all U.S. Census block groups that contain any project facility and all block groups within 1.0 mile of the proposed compressor stations and booster station. Race and income characteristics for block groups were compiled from the 2011 to 2015 American Community Survey 5-year estimates. The general population for this analysis is defined as the population of the county that contains the affected block groups. Table 4.9.8-1 summarizes the minority and low income statistics for these census tracts, block groups, and counties, and for the State of Oklahoma for reference. Values indicated in bold indicate environmental justice populations.

As shown in table 4.9.8-1, there are 3 environmental justice populations within the 34 block groups in the environmental justice study area based on the criteria identified above. This includes one block group that has a minority population more than 10 percentage points greater than the corresponding county share, and two block groups that have low-income populations more than 10 percentage points greater than the corresponding county share. None of the census block groups in the analysis area have minority or low-income populations that are greater than 50 percent of the respective block group population.

Census Tract 8921, Block Group 2 in Carter County, which contains a minority population more than 10 percent points higher than the county comparison group, would be crossed by the 36-inch-diameter Mainline and 16-inch-diameter Velma Lateral. The Tatums Compressor Station is about 0.7 mile north of Census Tract 8921, Block Group 2. The Mainline was generally sited through agricultural land, open land, and forest, and away from residences.

Census Tract 3001, Block Groups 2 and 3 in Canadian County contain low-income populations and would be crossed by the 36-inch-diameter Mainline. In addition, the Calumet Compressor Station would be within Census Tract 3001, Block Group 2. The Mainline was also generally sited through agricultural land and away from residences within this area.

About 20.6 miles (8.8 percent) of the 234.1-mile-long MIDSHIP Project pipeline routes would cross environmental justice communities and the remaining 91.2 percent would cross non-environmental justice communities, indicating that construction of the pipeline and associated facilities would not disproportionately affect environmental justice communities. Most of the population residing within 1.0 mile of the Calumet Compressor Station (92.3 percent) is within an environmental justice community. However, the compressor station was sited to maximize efficiency, minimize impacts on wetlands and visual resources, maximize the distance to the nearest noise-sensitive area (NSA), avoid construction of an additional lateral pipeline, and not to disproportionately affect environmental justice communities. Most of the population residing within 1.0 mile of the Tatums Compressor Station (92.4 percent) is composed of non-environmental justice populations; the remaining 7.6 percent of the population is within an environmental justice community. The Bennington Compressor Station and the Sholem Booster Station would not be within 1.0 mile of any environmental justice communities. In addition, the compressor and booster stations are generally sited within rural, low-density residential and agricultural lands (see section 4.8).

TABLE 4.9.8-1

Race and Income Data for the MIDSHIP Project Environmental Justice Study Area

Geography	Percent Minority [a]	Percent Low Income [b]
State of Oklahoma	32.7	15.9
Kingfisher County	21.8	7.5
Census Tract 9584, Block Group 1	6.8	4.5
Census Tract 9584, Block Group 2	8.4	6.8
Canadian County	22.0	7.5
Census Tract 3001, Block Group 1	11.9	14.9
Census Tract 3001, Block Group 2	31.7	**22.5**
Census Tract 3001, Block Group 3	9.8	**22.1**
Census Tract 3002.02, Block Group 2	19.7	13.4
Census Tract 3002.02, Block Group 3	8.9	6.3
Census Tract 3007, Block Group 3	19.0	10.6
Grady County	17.8	12.5
Census Tract 7, Block Group 1	19.6	12.2
Census Tract 7, Block Group 2	12.8	16.2
Census Tract 7, Block Group 3	21.8	12.4
Census Tract 8, Block Group 1	11.2	6.0
Census Tract 8, Block Group 2	14.8	8.5
Census Tract 9.01, Block Group 1	14.1	11.5
Census Tract 9.01, Block Group 3	8.9	17.8
Garvin County	22.9	18.4
Census Tract 6817, Block Group 2	12.5	13.0
Census Tract 6819, Block Group 2	10.6	9.6
Stephens County	18.6	15.3
Census Tract 9.02, Block Group 1	19.8	16.6
Census Tract 10, Block Group 1	7.2	8.6
Census Tract 10, Block Group 2	23.5	17.8
Census Tract 10, Block Group 3	12.0	15.9
Carter County	28.6	14.5
Census Tract 8921, Block Group 1	29.6	8.4
Census Tract 8921, Block Group 2	**39.0**	20.4
Census Tract 8921, Block Group 3	26.4	20.7
Census Tract 8922, Block Group 2	16.1	13.2
Johnston County	29.3	18.6
Census Tract 6601.98, Block Group 2	23.3	15.5
Census Tract 6602, Block Group 1	27.5	3.4
Census Tract 6602, Block Group 5	30.3	27.0
Census Tract 6603, Block Group 2	26.9	15.8
Bryan County	27.4	18.5
Census Tract 7956, Block Group 1	24.2	27.4
Census Tract 7957, Block Group 1	18.8	15.4
Census Tract 7957, Block Group 2	33.0	27.0
Census Tract 7957, Block Group 3	27.0	24.5
Census Tract 7960.01, Block Group 2	26.8	13.0

[a] U.S. Census Bureau, 2015g.
[b] U.S. Census Bureau, 2015b.
Note: Bold text indicates environmental justice populations.

The primary adverse impacts on the environmental justice communities associated with the construction of the project would be temporary increases in dust, noise, and traffic from construction. These impacts would occur along the entire pipeline route. Midship Pipeline would implement a variety of measures that would minimize potential impacts on nearby communities, including environmental justice communities. For instance, Midship Pipeline proposes to employ proven construction-related practices to control fugitive dust, such as application of water or other commercially available dust control agents on unpaved areas subject to frequent vehicle traffic. Similarly, Midship Pipeline would implement noise control measures during project construction (see section 4.11.2).

Long-term potential adverse effects include potential air quality and noise impacts from the operation of aboveground facilities. As described in sections 4.11.1 and 4.11.2, respectively, emissions from the project's aboveground facilities would meet air quality requirements and comply with required air emissions permits, and the facilities would be designed and constructed to avoid intrusive noise levels at residences, recreational areas, and other special interest areas. As a result, operation of the aboveground facilities would not be expected to have a significant impact on air quality or noise for any population, including environmental justice populations.

Section 4.12 describes the risks to public safety that could result from a pipeline or aboveground facility failure, and describes how applicable safety regulations and standards would minimize the potential for these risks. There is no evidence that such risks would be disproportionately borne by any racial, ethnic, or socioeconomic group.

In general, although the racial and economic composition of some census block groups crossed by the project meet the criteria of environment justice communities, we conclude that the MIDSHIP Project would not cause a disproportionate share of adverse environmental or socioeconomic impacts on any racial, ethnic, or socioeconomic group, or on block groups that meet the environmental justice criteria.

4.9.9 Conclusion

Construction of the MIDSHIP Project would not have a significant adverse impact on local populations, housing, employment, or the provision of community services. There would be temporary increases in traffic levels due to the commuting of the construction workforce to the project area, as well as the movement of construction vehicles and delivery of equipment and materials to the construction right-of-way. With the implementation of the measures described in the preceding sections, impacts on traffic and transportation would be minor and temporary.

While the project would affect some areas that meet the criteria for environmental justice areas, there is no evidence that the project would cause adverse and disproportionate impacts on minorities or low income populations. The long-term socioeconomic effect of the project is likely to be beneficial, although minor, based on the increase in tax revenues that would accrue in the counties affected by the project. Based on the analysis presented, and with our recommendation, we conclude that the project would not have a significant adverse effect on the socioeconomic conditions of the study area.

4.10 CULTURAL RESOURCES

Section 106 of the NHPA, as amended, requires FERC to take into account the effect of its undertakings on properties listed in or eligible for listing in the National Register of Historic Places (NRHP) and to afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment. Midship Pipeline, as a non-federal party, is assisting us in meeting our obligations under section 106 of the NHPA

and the implementing regulations at 36 CFR 800 by preparing the necessary information, analyses, and recommendations, as authorized by 36 CFR 800.2(a)(3).

FERC defines the area of potential effect (APE) for direct effects to include areas subject to ground disturbance (e.g., the construction right-of-way, ATWS, compressor/meter stations, staging areas, new or to-be-improved access roads). The APE for indirect (visual or audible) effects includes those aboveground ancillary facilities or other project elements that are visible from historic properties in which the setting contributes to their NRHP-eligibility.

4.10.1 Cultural Resources Consultations

On January 27, 2017 and March 22, 2017, we sent copies of our NOI and Supplemental NOI for the MIDSHIP Project, respectively, to a wide range of stakeholders, including the appropriate State Historic Preservation Office (SHPO), federal and state agencies, federally recognized tribes (tribes) that may have an interest in the project area, and other stakeholders. The NOI and Supplemental NOI contained paragraphs about section 106 of the NHPA, and stated that we use the notice to initiate consultations with the SHPOs and to solicit their views and those of other government agencies, interested tribes, and the public on the project's potential effects on historic properties.

In addition to FERC's notification process, Midship Pipeline separately contacted the Oklahoma Historical Society, which serves as the SHPO, the Oklahoma Archaeological Survey (OAS), other agencies, and tribes that might attach cultural or religious significance to cultural resources in the project area.

In Oklahoma, the SHPO reviews and comments on historic-period archaeological sites and architectural resources and the OAS reviews and comments on pre-contact resources.

4.10.1.1 State Historic Preservation Office

Midship Pipeline met with the OAS on November 11, 2016, to introduce the MIDSHIP Project and discuss survey protocol. A summary of the survey protocol was included in a December 2, 2016, letter Midship Pipeline sent to the OAS. The OAS agreed with the proposed survey protocol in a meeting with Midship Pipeline on December 16, 2016. Midship Pipeline met with the OAS on January 26, 2017, to present a revised survey protocol and discuss potential areas to investigate for deeply buried cultural deposits suggested by the OAS.

In a June 14, 2017 telephone conference, Midship Pipeline discussed the deep testing plan with the OAS. On August 29, 2017, Midship Pipeline submitted the draft deep testing plan to the OAS. The OAS approved the deep testing plan in an October 2, 2017 email. Midship Pipeline submitted copies of the archaeological deep testing report to the OAS and SHPO on January 31, 2018. On March 1, 2018, the SHPO deferred comments on the deep testing results to the OAS, and the OAS commented on the deep testing report.

Midship Pipeline submitted Volumes I and II of the Phase I cultural resources survey reports to the OAS and SHPO on May 31, 2017. On June 21, 2017, the SHPO commented on Volumes I and II of the Phase I survey reports. On June 30, 2017, the OAS commented on Volumes I and II of the Phase I survey reports.

Midship Pipeline submitted an addendum survey report, which included results of cultural resources surveys conducted in June 2017, to the OAS and the SHPO on September 5, 2017. On October 3, 2017, the SHPO commented on the recommendations for the newly identified historic resources. On

October 3, 2017, the OAS commented on the recommendations for the newly identified pre-contact archaeological sites.

On November 9, 2017, Midship Pipeline submitted revised copies of Volumes I and II of the Phase I survey reports and Unanticipated Discoveries Plan to the OAS and SHPO; these revised documents addressed comments previously provided by the OAS and SHPO. On December 5 and 13, 2017, the SHPO and OAS, respectively, commented on the revised Volumes I and II Phase I survey reports.

On January 19, 2018, the SHPO provided comments on the Phase II testing plans for sites 34CA392, 34CA393, 34JN199, 34BR386, 348R390, and 34KG81. In letters dated March 1, 2018, and March 14, 2018, the SHPO and OAS respectively acknowledged receipt of Phase II testing plans.

On January 26, 2018, Midship Pipeline met with OAS.

On March 8, 2018, the OAS commented on the revised Volumes I and II of the Phase I survey reports and the addendum survey report. On March 9, 2018, Midship Pipeline submitted a second addendum survey report, which included the results of cultural resources surveys and a historic viewshed survey conducted in October and December 2017, to the OAS and the SHPO.

The deep testing report, comments on the report, the Phase II testing plans, the OAS and SHPO letters on the plans, documentation of the January 26, 2018 meeting, and the OAS and SHPO comments on the revised survey reports must be filed with the Commission.

4.10.1.2 Other State and Federal Agencies

On October 25, 2016, Midship Pipeline sent a letter to the Bureau of Indian Affairs (BIA) Southern Plains Region and Eastern Oklahoma Region to introduce the project. In phone calls on October 26 and November 17, 2016, the BIA Southern Plains Region indicated it would become involved in the project if it crosses Indian trust land and requested digital files of the project facilities, which Midship Pipeline sent in December 2016. On November 9, 2017, Midship Pipeline sent digital files of the current project route to the BIA Southern Plains Region to identify whether the project crosses Indian trust land in that region. In a phone call on December 4, 2017, the BIA Southern Plains Region confirmed there are no known Indian trust lands crossed by the project within the Southern Plains region.

On November 10, 2017, Midship Pipeline provided project location information to the BIA Eastern Oklahoma Region – Chickasaw Agency in order to identify whether the project crosses Indian trust lands within in its region. On January 19, 2018, the BIA – Chickasaw Agency sent an email with its assessment of Chickasaw allotment lands and determined that the MIDSHIP Project crosses tribal trust land within the BIA Eastern Oklahoma Region. Midship Pipeline called the BIA – Chickasaw Agency on March 28, 2018 to request landowner addresses of lands held in trust and record of receipt. This documentation must be filed with the Commission.

On February 2, 2018, Midship Pipeline submitted a request for an Archaeological Resources Protection Act (ARPA) permit to the BIA Eastern Oklahoma Region office. On April 13, 2018, Midship Pipeline submitted additional copies of the ARPA permit request to the BIA Eastern Oklahoma Region office for submission to consulting parties.

4.10.1.3 Federally Recognized Tribes

Between October 27 and December 11, 2016, Midship Pipeline sent letters to 18 federally recognized tribes requesting comments on the project and the identification of any cultural or religious sites significant to the tribe. The 18 federally recognized tribes include:

- Alabama-Quassarte Tribal Town;
- Apache Tribe of Oklahoma;
- Caddo Nation of Oklahoma;
- Cheyenne and Arapaho Tribes of Oklahoma;
- Chickasaw Nation;
- Choctaw Nation of Oklahoma;
- Comanche Nation of Oklahoma;
- Delaware Nation of Oklahoma;
- Fort Sill Apache Tribe of Oklahoma;
- Kialegee Tribal Town;
- Kiowa Indian Tribe of Oklahoma;
- Muscogee (Creek) Nation;
- Osage Nation;
- Quapaw Tribe of Indians;
- Seminole Nation of Oklahoma;
- Thlopthlocco Tribal Town;
- Tonkawa Tribe of Indians of Oklahoma; and
- Wichita and Affiliated Tribes.

On December 1, 2016, Midship Pipeline sent project introduction letters to alternate contacts for six of the tribes, including:

- Apache Tribe of Oklahoma;
- Caddo Nation of Oklahoma;
- Comanche Nation of Oklahoma;
- Delaware Nation of Oklahoma;
- Kiowa Indian Tribe of Oklahoma; and
- Tonkawa Tribe of Indians of Oklahoma.

On March 17, 2017, we sent letters to the 18 federally recognized tribes to request their comments on the project and identify any concerns about properties of traditional religious or cultural significance that may be affected. On March 21, 2017, Midship Pipeline also sent project update letters to the 18 federally recognized tribes.

In response to Midship Pipeline's project introduction letters, the Cheyenne and Arapaho Tribes of Oklahoma, the Chickasaw Nation, the Choctaw Nation, and the Osage Nation requested maps and/or digital files of the project. Midship Pipeline provided the requested information via email between December 2016 and February 2017.

On November 1, 2016, the Muscogee (Creek) Nation sent an email stating the project lies outside of its area of historic interest and that it would defer to other tribes. On December 7, 2016, the Osage Nation requested to be a consulting party on the project. In a letter dated January 2, 2017, the Kiowa Tribe of Oklahoma indicated it had no concerns with the project as planned and requested to be included in the Unanticipated Discoveries Plan.

On January 5, 2017, the Seminole Nation of Oklahoma sent an email stating the tribe would defer to the Choctaw Nation of Oklahoma and/or the Caddo Nation if either of those tribes has concerns with the project. On February 8, 2017, the Seminole Nation of Oklahoma submitted a comment requesting a list of flora in the project area and requesting to be included in the Unanticipated Discoveries Plan. Midship Pipeline discussed this request with the tribe in a phone call on February 10, 2017 and committed to sending this list to the tribe in November 2017. During this call, the tribe also indicated it does want to be consulted if the Choctaw Nation of Oklahoma and the Caddo Nation identify the project as outside their area of interest. Midship Pipeline provided the requested flora list in an email dated November 11, 2017.

In letters dated January 11, February 16, and March 22, 2017, the Comanche Nation indicated it had reviewed the project and identified no properties of traditional religious or cultural significance within the project area.

Between January 12 and February 2, 2017, Midship Pipeline met with representatives of six tribes (the Caddo Nation of Oklahoma, the Cheyenne and Arapaho Tribes of Oklahoma, the Chickasaw Nation, the Choctaw Nation, the Delaware Nation, and the Wichita and Affiliated Tribes) to provide additional information and answer questions regarding the project. The Chickasaw Nation met with Midship Pipeline to discuss the project but indicated it would prefer to deal directly with FERC.

In a letter dated February 27, 2017, the Cheyenne and Arapaho Tribes of Oklahoma indicated it had reviewed the project, identified no properties of traditional religious or cultural significance within the project area, and requested to be included in the Unanticipated Discoveries Plan.

On March 1 and 10, 2017, the Caddo Nation of Oklahoma and the Choctaw Nation, respectively, each submitted requests for copies of the cultural resources survey reports. Midship Pipeline sent copies of these reports to the tribes on June 15, 2017.

On March 28, 2017, the Delaware Nation replied to the project update, indicating it has no concerns with the MIDSHIP Project and requesting to be included in the Unanticipated Discoveries Plan.

On July 13, 2017, the Chickasaw Nation left a voicemail for Midship Pipeline requesting a copy of the SHPO's comments on the draft cultural reports and expressed concerns regarding Chickasaw trails and viewsheds.

On August 22, 2017, Midship Pipeline sent invitations to the 18 federally recognized tribes to invite them to participate in a workgroup meeting for developing the Tribal Monitoring Plan and Unanticipated Discoveries Plan.

On August 23, 2017, the Muscogee (Creek) Nation declined participation in the workgroup meeting and provided comments on the Unanticipated Discoveries Plan.

On August 28, 2017, the Choctaw Nation indicated the tribe is interested in meeting with Midship Pipeline to discuss the cultural resource survey reports. On August 29, 2017, Midship Pipeline participated in a conference call with the Choctaw Nation to discuss future face-to-face meetings and concerns over cultural resources.

On August 31, 2017, the Quapaw Tribe of Oklahoma sent a letter to Midship Pipeline indicating the tribe does not wish to further consult or comment on the project at this time.

On September 5, 2017, the Chickasaw Nation concurred with the eligibility recommendations for all of the archaeological sites, aboveground historic structures, and isolated finds in the cultural resources survey reports. The Chickasaw Nation also provided information on areas of concern to the tribe in the

vicinity of the MIDSHIP Project, requested archaeological monitoring around areas where cultural resources have been identified, and asked to be included in the Unanticipated Discoveries Plan. On February 18, 2018, Midship Pipeline sent a letter to the Chickasaw Nation addressing the areas of concern identified in the letter.

On September 6, 2017, the Thlopthlocco Tribal Town accepted Midship Pipeline's invitation to the working group meeting and provided comments on the Tribal Monitoring Plan and the Unanticipated Discoveries Plan. On September 13, 2017, the Thlopthlocco Tribal Town requested copies of previously submitted documents be sent to the new Tribal Historic Preservation Officer. On September 14, 2017, Midship Pipeline sent copies of communications and project information and a compact disc with copies of Volumes I and II of the cultural resources survey reports, survey maps, and the Unanticipated Discoveries Plan. On October 12, 2017, the Thlopthlocco Tribal Town sent a letter to Midship Pipeline commenting on the survey reports.

On September 15, 2017, Midship Pipeline sent notice of the FERC 7(c) Application, project update information, and the addendum cultural resources survey report to the 18 federally recognized tribes.

On September 26, 2017, Midship Pipeline re-sent a copy of the workgroup meeting invitation, FERC application, and the addendum cultural resources survey report to the Choctaw Nation.

On October 10, 2017, the Kiowa Tribe sent an email to Midship Pipeline with comments on the Tribal Monitoring Plan. On October 20, 2017, the Cheyenne and Arapaho Tribes of Oklahoma declined participation in developing either the Tribal Monitoring Plan or the Unanticipated Discoveries Plan. On October 26, 2017, the Osage Nation sent an email with comments on the Tribal Monitoring Plan and Unanticipated Discoveries Plan.

On October 23, 2017, the Comanche Nation sent a letter to Midship Pipeline with comments on the survey reports indicating their site file review did not identify any properties of traditional religious or cultural significance within the project area.

On October 27, 2017, the Seminole Nation of Oklahoma sent an email requesting a full survey and listing of the flora be conducted for the MIDSHIP Project, and that federal partners and the Project Manager for the MIDSHIP Project be present at meetings. On November 11, 2017, Midship Pipeline sent a list of flora found during surveys conducted for the MIDSHIP Project to the Seminole Nation of Oklahoma.

On October 27, 2017, Midship Pipeline met with representatives of the Apache Tribe of Oklahoma, the Caddo Nation of Oklahoma, the Chickasaw Nation, the Choctaw Nation of Oklahoma, the Delaware Nation, the Osage Nation, the Seminole Nation of Oklahoma, and the Thlopthlocco Tribal Town to discuss the Tribal Monitoring Plan and Unanticipated Discoveries Plan developed for the MIDSHIP Project.

On December 19, 2017, FERC held a telephone conference with federally recognized tribes in follow up to an October 27, 2017 meeting between Midship Pipeline and the tribes to discuss the possibility of tribal monitoring during construction of the MIDSHIP Project. Representatives of the Apache Tribe of Oklahoma, Caddo Nation of Oklahoma, Cheyenne and Arapaho Tribes, Chickasaw Nation, Choctaw Nation of Oklahoma, Delaware Nation, Osage Nation, and Thlopthlocco Tribal Town participated in the teleconference. FERC explained its preference for early tribal involvement and identification of areas of concern prior to construction, rather than implementing tribal monitoring during construction, and requested the tribes' feedback on Midship Pipeline's survey reports/results and comments on any areas that may require additional review.

During the conference call with FERC, the Choctaw Nation of Oklahoma requested additional background information on four historic sites in Bryan County, Oklahoma. On February 15, 2018, Midship

Pipeline sent a letter and additional background research to the Choctaw Nation of Oklahoma regarding the requested four historic archaeological sites and two prehistoric sites that may be of interest in Bryan County, Oklahoma. In a phone call and email on February 27, 2018, the Choctaw Nation and Midship Pipeline discussed site information recorded by the tribe's archaeologists. In a March 22, 2018, email to Midship Pipeline, the Choctaw Nation concurred with the recommendations for the six sites located in Bryan County, Oklahoma and requested a copy of the Phase II testing report. On April 6, 2018, Midship Pipeline sent an email to the Choctaw Nation to invite representatives to visit sites that are being subjected to Phase II testing, which was accepted in a phone call and email on April 13, 2018.

On February 15, 2018, Midship Pipeline sent letters to the Apache Tribe of Oklahoma, Cheyenne and Arapaho Tribes, and the Delaware Nation requesting specific locations of interest to the tribes in order to facilitate visits to these locations.

In phone calls and emails on March 1 and March 27, 2018, Midship Pipeline and the Chickasaw Nation discussed the status of the tribe's review of its lands in relation to the MIDSHIP Project.

On March 6, 2018, the Cheyenne and Arapaho Tribes sent a letter to FERC stating that the tribe concurs with FERC's efforts regarding the draft EIS.

On March 28, 2018, Midship Pipeline sent an email to the Cheyenne and Arapaho Tribes to invite representatives to visit sites that are being subjected to Phase II testing, which was accepted in a phone call on March 30, 2018. On April 12, 2018, the Cheyenne and Arapaho Tribes sent a letter with recommendations from the Tribal Historic Preservation Office.

On March 29, 2018, the Osage Nation sent a letter to FERC stating that the tribe had no specific comments on the draft EIS. The tribe requested copies of the final survey reports for review and comment, and stated that Midship Pipeline should not begin construction until the provisions of the NHPA are satisfied.

On April 13, 2018, Midship Pipeline mailed copies of the ARPA permit application to the Chickasaw Nation and the Osage Nation as consulting parties.

The April 13, 2018 emails with the Choctaw Nation, the March 1 and 27, 2018 emails with the Chickasaw Nation, the April 12, 2018 letter from the Cheyenne and Arapaho Tribes, and the April 13, 2018 letters enclosing the ARPA permit to the Chickasaw and Osage Nations must be filed with the Commission.

4.10.2 Results of Cultural Resources Surveys

Midship Pipeline conducted cultural resource surveys of the proposed pipeline routes and aboveground facilities between December 2016 and April 2017, in June 2017, in October 2017, and in December 2017 (Bruckse Bury et al., 2017a, 2017b, 2017c, 2018). This included historic structures and archaeological surveys along the pipeline routes and a viewshed survey of potential historic structures within the viewshed of proposed aboveground facilities. Cultural resource surveys were conducted within a 200-foot-wide survey corridor for the pipeline routes and for the full footprint of the contractor yards, compressor stations, and other aboveground facilities. To date, archaeological surveys have been completed for:

- about 226.7 miles of the total 234.1 miles of pipeline corridor;
- the Calumet, Tatums, and Bennington Compressor Stations;
- the Sholem Booster Station;
- 7 receipt meters;
- 2 receipt taps;

- 4 delivery meters;
- the Ardmore, Chickasha, and Yukon Contractor Yards;
- 111 access roads; and
- 21 other appurtenant facilities.

The archaeological surveys identified 36 isolated finds and 58 cultural resources within the APE. The cultural resources identified during survey include 49 archaeological sites (28 pre-contact sites, 18 historic sites, and 3 containing both historic and pre-contact components), and 9 historic architectural resources. Midship Pipeline's cultural resources consultant recommended the majority (39) of the archaeological sites (18 pre-contact, 18 historic, and 3 sites containing both historic and pre-contact components), the 9 historic architectural resources, and all 36 isolated finds as not eligible for listing in the NRHP.

The analysis of the indirect APE identified 20 possible historic structure locations within the viewshed of 8 proposed facilities (the Calumet and Bennington Compressor Stations; the Sholem Booster Station; and the Chisholm, Okarche/Mark West, Grady, Velma, and Bennington Meter Stations). No potential historic structures were identified within the indirect APE of the Tatums Compressor Station or the Canadian Valley, Cana, and NGPL 801 Meter Stations. No impacts on historic properties were identified during the viewshed analysis of historic structures within the indirect APE of the proposed facilities.

The SHPO concurred with the recommendation that the historic archaeological sites, historic architectural resources, and the historic component of three multicomponent sites are not eligible for listing in the NRHP. We concur with these recommendations.

The OAS concurred with the recommendation that 16 pre-contact archaeological sites and the pre-contact component of 3 multicomponent sites are not eligible for listing in the NRHP. The OAS did not concur with the eligibility recommendation of not eligible for one site (34CA395) and suggested further investigation would be needed in order to make an eligibility determination. The boundaries of one additional pre-contact site (34JN198) extend outside of the APE; however, OAS concurred that the portion of the site within the APE lacks research potential and is not eligible. We concur with these recommendations.

The OAS recommended avoidance or additional testing to determine the eligibility of eight sites (34CA392, 34CA393, 34JN199, 34BR386, 34BR390, 34CA395, 34JN205, and 34KG81). Six of these sites (34CA392, 34CA393, 34JN199, 34BR386, 34BR390 and 34KG81) cannot be avoided and Midship Pipeline will conduct additional testing to determine their eligibility for listing in the NRHP. Site 34CA395 will be avoided by the project; therefore, no additional testing will be conducted on this site. Midship is still evaluating whether the remaining site (34JN205) can be avoided. If the site cannot be avoided, Midship Pipeline indicates that it would conduct additional testing to determine its eligibility for listing in the NRHP. We concur with these recommendations.

To date, comments from the OAS on the newly recorded sites (34JN206, 34JN207, and 34KG86) have not been received.

4.10.3 Outstanding Cultural Resource Investigations

Archaeological surveys have not been completed for about 7.4 miles of the pipeline corridors (mainline and laterals), one receipt meter, and 5 access roads. Deep testing to investigate for deeply buried cultural deposits has not been completed.

4.10.4 Unanticipated Discovery Procedures

Midship Pipeline prepared draft *Procedures Guiding the Discovery of Unanticipated Cultural Resources and Human Remains* that it would implement in the event that cultural resources or human remains are encountered during construction of the project. Midship Pipeline provided its plan to the SHPO and the OAS on May 31, 2017. On June 21, 2017, the SHPO provided comments on the plan; Midship Pipeline revised the plan to incorporate comments from the SHPO. On August 22, 2017, Midship Pipeline invited tribes to a meeting to discuss development of the Unanticipated Discoveries Plan. Comments from this meeting are being incorporated by Midship Pipeline into a revised Unanticipated Discoveries Plan; the revised plan has not been received by FERC to date.

4.10.5 General Impacts and Mitigation

Compliance with section 106 of the NHPA cannot be completed for the MIDSHIP Project until cultural resources surveys and evaluations for portions of the project are complete, and consultation with the SHPO and Indian tribes are complete. If NRHP-eligible resources are identified that cannot be avoided, Midship Pipeline would need to prepare treatment plans for review and approval by the appropriate parties including FERC, the SHPO, and Indian tribes. FERC would afford the ACHP an opportunity to comment in accordance with 36 CFR 800.6. Implementation of a treatment plan would only occur after certification of the project and after FERC provides written notification to proceed.

To ensure that FERC's responsibilities under the NHPA and its implementing regulations are met, **we recommend that:**

- **Midship Pipeline should not begin construction of facilities and/or use of staging, storage, or temporary work areas and new or to-be-improved access roads until:**

  a. **Midship Pipeline files with the Secretary:**

     i. **the remaining cultural resources survey report(s);**

     ii. **site evaluation report(s) and avoidance/treatment plan(s), as required; and**

     iii. **comments on the cultural resources reports and plans from the Oklahoma State Historic Preservation Office and interested Indian tribes.**

  b. **The ACHP is afforded an opportunity to comment if historic properties would be adversely affected.**

  c. **The FERC staff reviews and the Director of the OEP approves the cultural resources reports and plans, and notifies Midship Pipeline in writing that treatment plans/mitigation measures (including archaeological data recovery) may be implemented and/or construction may proceed.**

  All materials filed with the Commission containing location, character, and ownership information about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering "CUI//PRIV – DO NOT RELEASE."

4.11 AIR QUALITY AND NOISE

4.11.1 Air Quality

Air quality would be affected by construction and operation of the MIDSHIP Project. Temporary emissions would be generated during project construction as a result of the use of gasoline- and diesel-fired combustion equipment, and earth-moving activities. The operational emissions associated with the project would be from the aboveground facilities, primarily from operation of the proposed compressor stations. This section of the EIS addresses the construction and operational emissions from the project, as well as projected impacts on air quality and applicable regulatory requirements.

4.11.1.1 Regional Climate

Regional climate in the project area is influenced by the Great Plains Region and, to a lesser extent, the warm, moist air currents from the Gulf of Mexico. Summers are typically long and hot, while winters are comparatively mild and short. The project area receives an annual average of 36.5 inches of precipitation. The annual average temperature across the region is 63 °F. The region's coldest temperatures occur during the winter months and on average range between 39 and 49 °F. The warmest temperatures occur during the summer months and on average range between 79 and 83 °F.

Existing Air Quality

The CAA, Title 42 USC section 7401 et seq., amended in 1977 and 1990, is the primary federal statute governing air pollution. The EPA, as required by the CAA, has established National Ambient Air Quality Standards (NAAQS) to protect public health (primary standards) and public welfare (secondary standards). Standards have been set for six principal pollutants that are called "criteria pollutants." These criteria pollutants are ground-level ozone, carbon monoxide (CO), oxides of nitrogen (NO_X), sulfur dioxide (SO_2), respirable and fine particulate matter (inhalable particulate matter with an aerodynamic diameter less than or equal 10 microns [PM_{10}] and less than or equal to 2.5 microns [$PM_{2.5}$]), and airborne lead. Ozone is not directly emitted into the atmosphere from an emissions source. Ozone develops as a result of a chemical reaction between NO_X and volatile organic compounds (VOC) in the presence of sunlight. Therefore, NO_X and VOCs are often referred to as ozone precursors. The current NAAQS are available on the EPA's website.[19]

States have the authority to adopt ambient air quality standards if they are more stringent than the NAAQS. The ODEQ has adopted all of the NAAQS in full and has not developed any more stringent ambient air quality standards.

Air quality monitoring data from the EPA AirData website for calendar years 2014 to 2016 were reviewed to characterize background air quality for regulated criteria pollutants for each compressor station and the booster station and are presented in table 4.11.1-8 in combination with the project's impact for comparison with the NAAQS.

An air quality control region (AQCR) is defined under 42 USC section 7407(c) as "...any interstate area or major intrastate area which [the Administrator of the EPA] deems necessary or appropriate for the attainment and maintenance of ambient air quality standards." Each AQCR, or portion(s) of an AQCR, is classified as either "attainment," "nonattainment," "unclassifiable," or "maintenance" with respect to the

[19] The current NAAQS can be accessed online at https://www.epa.gov/criteria-air-pollutants/naaqs-table

NAAQS. Areas where ambient air concentrations of the criteria pollutants are below the levels listed in the NAAQS are considered in attainment. If ambient air concentrations of criteria pollutants are above the NAAQS levels then the area is considered to be nonattainment. Areas that have been designated nonattainment but have since demonstrated compliance with the NAAQS are designated as in maintenance for that pollutant. Maintenance areas are treated similarly to attainment areas for the permitting of stationary sources; however, specific provisions may be incorporated through the state's approved maintenance plan to ensure that air quality would remain in compliance with the NAAQS for that pollutant. Areas where air quality data are not available are considered to be unclassifiable and are treated as attainment areas. None of the counties affected by the project are designated nonattainment or maintenance areas.

Greenhouse Gases

Greenhouse gases (GHG) occur in the atmosphere both naturally and as a result of human activities, such as the burning of fossil fuels. These gases are the integral components of the atmosphere's greenhouse effect that warms the earth's surface and moderates day/night temperature variation. In general, the most abundant GHGs are water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and ozone.

The EPA has defined air pollution to include the mix of six long-lived and directly emitted GHGs (CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride). The EPA found that the current and projected concentrations of these six GHGs in the atmosphere threaten the public health and welfare of current and future generations through climate change.

As with any fossil fuel-fired project or activity, the project would contribute to GHG emissions. The principle GHGs that would be produced by the project are CO_2, CH_4, and N_2O. Emissions of GHGs are quantified and regulated in units of carbon dioxide equivalents (CO_2e). The CO_2e unit of measure takes into account the global warming potential (GWP) of each GHG over a specified timeframe. The GWP is a ratio relative to CO_2 that is based on the particular GHG's ability to absorb solar radiation as well its residence time within the atmosphere. Thus, CO_2 has a GWP of 1, CH_4 has a GWP of 25, and N_2O has a GWP of 298 on a 100-year timescale (EPA, 2017f). To obtain the CO_2e quantity, the mass of the particular compound is multiplied by the corresponding GWP, the product of which is the CO_2e for that compound. The CO_2e value for each of the GHG compounds is summed to obtain the total CO_2e GHG emissions.

The EPA has expanded its regulations to include the emission of GHGs from major stationary sources under the Prevention of Significant Deterioration (PSD) program. The EPA's current rules require that a stationary source that is major for a non-GHG-regulated New Source Review (NSR) pollutant must also obtain a GHG PSD permit prior to beginning construction of a new or modified major source with mass-based GHG emissions equal to or greater than 100,000 tons per year (tpy) and significant net emission increases in units of CO_2e equal to or greater than 75,000 tpy. There are no NAAQS or other significance thresholds for GHGs.

4.11.1.2 Air Quality Regulatory Requirements

The MIDSHIP Project would be potentially subject to a variety of federal and state regulations pertaining to the construction and operation of air emission sources.

Federal Air Quality Requirements

New Source Review and Prevention of Significant Deterioration

NSR is a preconstruction permitting program designed to protect air quality when air pollutant emissions are increased either through the modification of existing sources or through the construction of a new source of air pollution. Federal preconstruction review under NSR is conducted under separate procedures for sources in attainment areas and sources in nonattainment areas. As noted in section 4.11.1.1, none of the project facilities would be in a nonattainment area; therefore, Nonattainment New Source Review does not apply to the project. In areas in attainment with the NAAQS, NSR ensures that emissions do not degrade the air quality, which is achieved through the implementation of the PSD permitting program or state minor source permit programs. In addition, NSR ensures that any large, new, or modified industrial source uses air pollution control technology. The EPA usually delegates the NSR permitting program to state and/or local air quality agencies that have established permitting thresholds and other requirements. Based on the operating emissions presented in tables 4.11.1-2 through 4.11.1-7, an NSR permit would not be required for any of the compressor stations or the booster station.

Title V Operating Permit Program

Title V is an operating permit program run by each state. As detailed in section 4.11.1.3, the potential-to-emit (PTE) and proposed equipment at the new compressor stations and booster station would not be subject to Title V.

The EPA issued the Title V GHG Tailoring Rule, which established permitting requirements and thresholds for GHGs. On June 23, 2014, the U.S. Supreme Court ruled that a facility may not be required to obtain a Title V permit based solely on GHG emissions; however, if a facility is a major stationary source based on the PTE of other regulated pollutants, a Title V permit may include permit references for GHGs.

New Source Performance Standards

The EPA promulgates New Source Performance Standards (NSPS) that establish emission limits and fuel, monitoring, notification, reporting, and recordkeeping requirements for new, modified, and reconstructed stationary source types or categories.

NSPS Subpart JJJJ (*Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*) sets emission standards for NO_X, CO, and VOCs. Subpart JJJJ would apply to the natural gas-fired emergency generator engines proposed for the Calumet, Tatums, and Bennington Compressor Stations and the two reciprocating engines that drive the compressors proposed for the Sholem Booster Station. Midship Pipeline would comply with all applicable requirements of Subpart JJJJ.

NSPS Subpart KKKK (*Standards of Performance for Stationary Combustion Turbines*) regulates emissions of NO_X and SO_2 from combustion turbines. Subpart KKKK would apply to the new gas turbines proposed for installation at the Calumet, Tatums, and Bennington Compressor Stations. Midship Pipeline would be required to comply with emission limitations for NO_X and SO_2, monitoring, recordkeeping, reporting, and emission testing requirements of this subpart.

NSPS Subpart OOOOa (*Standards of Performance for Oil and Natural Gas Sector*) regulates emissions of GHGs and VOCs from certain new and modified sources in the oil and natural gas section. Subpart OOOOa would apply to the same compressors at the proposed aboveground facilities.

Subpart OOOOa requires implementation of leak detection and repair programs at applicable natural gas compressor stations, requirements to limit GHG and VOC emissions from compressors and pneumatic controllers used at compressor stations, and includes requirements for recordkeeping and annual reporting. The EPA has proposed a stay on implementation of this subpart, which is currently under review. Midship Pipeline would implement the applicable portions of Subpart OOOOa at the aboveground facilities subject to this subpart based upon the final compliance schedule.

National Emission Standards for Hazardous Air Pollutants

The CAA Amendments established a list of 189 hazardous air pollutants (HAP), resulting in the promulgation of National Emission Standards for Hazardous Air Pollutants (NESHAP). NESHAPs regulate HAP emissions from stationary sources by setting emission limits, monitoring, testing, recordkeeping, and notification requirements. Subpart ZZZZ (*National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*) would be applicable to the emergency generators proposed at the Calumet, Tatums, and Bennington Compressor Stations and the reciprocating engines that drive the compressor proposed for the Sholem Booster Station. Midship Pipeline would comply with the monitoring, recordkeeping, and reporting requirements of Subpart ZZZZ by complying with NSPS Subpart JJJJ.

Mandatory Greenhouse Gas Reporting Rule

The EPA established the final Mandatory Greenhouse Gas Reporting Rule, which requires that petroleum and natural gas facilities that emit 25,000 metric tons or more of CO_2e per year report annual emissions of GHGs. Recent additions to the Mandatory Reporting Rule require reporting of GHG emissions generated during operation of natural gas pipeline systems, which would include blowdown emissions, equipment leaks, and vent emissions at compressor stations, as well as blowdown emissions between compressor stations. The applicability of the reporting rule would apply separately to each compressor station, the booster station, and the pipeline facilities.

General Conformity

A General Conformity applicability analysis is required for any part of the project occurring in nonattainment or maintenance areas for criteria pollutants. As noted in section 4.11.1.1, none of the counties affected by the project are designated nonattainment or maintenance areas. Therefore, General Conformity does not apply to project emissions.

State and Local Regulations

The construction and operation of emission sources at new facilities, such as compressor stations and booster stations, are regulated in Oklahoma by the air quality rules and regulations of the ODEQ, which are codified in Oklahoma Administrative Code (OAC) 252:100 – Air Pollution Control.

Stationary sources that emit 5 tpy or less of regulated air pollutants as defined in OAC 252:100, which include criteria pollutants, HAPs, and other air pollutants, are consider de minimis facilities and are exempt from air permitting requirements. As detailed in section 4.11.1.3, the proposed meter stations would be considered de minimis facilities; therefore, no air quality construction permits are required for these facilities.

The proposed Calumet, Tatums, and Bennington Compressor Stations and Sholem Booster Station would require minor facility air construction permits issued by the ODEQ. An air construction permit is required prior to beginning construction of these facilities. Midship Pipeline filed air construction permit applications for the proposed Calumet, Tatums, and Bennington Compressor Stations and Sholem Booster Station in May 2017. The ODEQ issued a construction permit for the Sholem Booster Station in August 2017, and a construction permit for the Tatums Compressor Station in October 2017. As of the date of the draft EIS, the permit applications for the remaining facilities are still under review with the ODEQ. An application for an operating permit for each of these facilities must be submitted to the ODEQ within 180 days of commencing operations.

In addition to the permitting requirements summarized above, the following ODEQ air pollution control regulations are applicable to the proposed compressor stations and/or booster station:

- OAC 252:100-9, Excess Emission Reporting Requirements;
- OAC 252:100-19, Control of Emissions of Particulate Matter;
- OAC 252:100-25, Visible Emissions;
- OAC 252:100-29, Control of Fugitive Dust;
- OAC 252:100-31, Control of Sulfur Compound Emissions;
- OAC 252:100-33: Control of Nitrogen Oxide Emissions;
- OAC 252:100-37: Control of VOC Emissions (storage and loading requirements); and
- OAC 252:100-43: Testing, Monitoring, and Recordkeeping Requirements.

Midship Pipeline has indicated in its permit applications how it intends to comply with each of these regulations for the construction and operation of the proposed Calumet, Tatums, and Bennington Compressor Stations and Sholem Booster Station. The fugitive dust control regulation (OAC 252:100-29) would apply to project construction activities, both at the aboveground facilities and along the pipeline route. Midship Pipeline has incorporated planned mitigation measures within the *Fugitive Dust Control Plan* (FDCP) further discussed in section 4.11.1.3 to comply with the fugitive dust control regulation.

4.11.1.3 Air Emissions Impacts and Mitigation

Construction Emissions and Mitigation

Air emissions would be generated during construction of the proposed pipelines, three new compressor stations, new booster station, new meter and regulator stations, and other ancillary facilities. Construction activities for the proposed facilities would result in temporary increases in emissions of some pollutants due to the use of equipment powered by diesel or gasoline engines. Construction activities would also result in the temporary generation of fugitive dust due to land clearing, ground excavation, and cut and fill operations. Indirect emissions during construction of the project would be generated by delivery vehicles and construction workers commuting to and from work areas.

Table 4.11.1-1 provides a summary of construction emissions associated with the various project facilities, including on-road and non-road vehicle emissions, fugitive dust emissions, emissions from HDD activities, and open burning emissions. Construction emissions were calculated using EPA calculation tools (EPA Motor Vehicle Emission Simulator 2014 for on-road and non-road equipment), fugitive dust and open burning calculation tools, and are an aggregate of emissions for the estimated 9-month duration of project construction.

TABLE 4.11.1-1

Construction Emissions for the MIDSHIP Project

Construction Year/Facility	Total Construction Emissions (PTE, tpy)						
	VOC	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_X	CO_2e
2018 [a]							
Mainline Pipeline	7.2	43.4	13.5	113.1	15.8	<0.1	11,678
Chisholm Lateral Pipeline	11.8	75.5	3.5	56.0	15.5	<0.1	3,539
Velma Lateral Pipeline	14.7	101.2	1.7	21.7	13.3	<0.1	1,837
Compressor Stations and Booster Station	7.7	53.7	18.0	21.8	8.3	<0.1	13,373
Meter Stations	13.0	53.7	9.2	4.7	3.2	<0.1	9,419
Receipt Taps	2.3	9.2	1.9	0.6	0.4	<0.1	1,943
Total 2018 Construction Emissions	**56.7**	**336.7**	**47.8**	**217.9**	**56.5**	**0.1**	**41,789**
2019 [a]							
Mainline Pipeline	279.1	1,943.5	27.1	549.4	282.3	<0.1	24,549
Chisholm Lateral Pipeline	4.2	17.4	7.8	91.1	10.0	<0.1	7,839
Velma Lateral Pipeline	15.9	106.0	2.5	24.2	13.6	<0.1	2,708
Compressor Stations and Booster Station	8.1	51.1	43.6	42.5	8.4	0.1	32,622
Meter Stations	8.0	32.3	7.9	3.1	1.9	<0.1	7,578
Receipt Taps	1.7	6.8	1.6	0.4	0.3	<0.1	1,557
Total 2019 Construction Emissions	**317.0**	**2,157.1**	**90.5**	**710.7**	**316.5**	**0.2**	**76,853**
TOTAL PROJECT CONSTRUCTION EMISSIONS	**373.7**	**2,493.8**	**138.3**	**928.6**	**373.0**	**0.3**	**118,642**

[a] **Construction activities in 2018 and 2019 would occur in Kingfisher, Canadian, Grady, Garvin, Stephens, Carter, Johnston, and Bryan counties.**

Midship Pipeline would minimize emissions from diesel- and gasoline-fired construction equipment by ensuring that vehicles and off-road construction equipment are built to EPA emission standards; limiting vehicles from driving off-road; and keeping traffic to designated roads and workspaces. We received comments expressing concern about fugitive dust during construction of the project. Midship Pipeline provided a FDCP, which outlines measures to be implemented during construction activities to minimize fugitive dust. As outlined in the FDCP, watering would be the primary means of dust abatement. Additional measures outlined in the FDCP include:

- limiting vehicles from tracking dust off of designated roads and keeping traffic to designated roads and workspaces;
- enforcing a 20-mile-per-hour speed limit on unpaved surfaces;
- covering open-body haul trucks;
- maintaining construction entrances at paved road access points; and
- enclosing the work area for discrete activities, such as abrasive blasting.

Midship Pipeline would require contractors to comply with the methods outlined in the FDCP during construction, restoration, and operation of the project and EIs and other key members would have stop work authority of the construction team in the event that fugitive dust control measures are not implemented in accordance with the FDCP. We reviewed the FDCP and find it acceptable.

Emissions from construction are not expected to result in a violation of any applicable ambient air quality standard; construction equipment would be operated on an as-needed basis generally during daytime hours. Midship Pipeline would operate and maintain gasoline and diesel engines used during construction in a manner consistent with the manufacturers' specifications and EPA standards, thus minimizing emissions. Current EPA sulfur-in-fuel standards for gasoline, on-road diesel, and off-road diesel would also contribute to minimizing emissions from construction equipment.

Construction emissions would occur over the duration of construction activity and would be emitted at different times and locations along the length of the proposed pipelines and at the aboveground facility sites. With the mitigation measures proposed by Midship Pipeline, air quality impacts from construction activities would be temporary or short-term, and should not result in a significant impact on local and regional air quality.

Midship Pipeline has indicated that open burning may be used to manage material collected during land clearing of pipeline right-of-way, aboveground facilities, access roads, and contractor yards. If used by the construction contractor, open burning activities would be conducted in accordance with ODEQ criteria identified in OAC 252:100-13. Open burning would not be conducted in Canadian or Grady Counties, due to restrictions associated with these activities. Construction emissions associated with open burning activities are included in table 4.11.1-1.

Operational Emissions and Mitigation

Operation of the project would result in air emissions from stationary equipment, such as the Calumet, Tatums, and Bennington Compressor Stations, the Sholem Booster Station, and the meter stations. The operational phase emissions from a variety of sources/equipment would be long term, extending over the lifetime of these facilities. These various sources and associated criteria pollutants, GHGs, and HAP emission rates are addressed in the following sections.

Calumet Compressor Station

The Calumet Compressor Station would be in Canadian County, Oklahoma and would include the following emission generating sources:

- two Solar Centaur 50 natural gas-fired turbines (about 6,188 horsepower [hp] each), coupled with two Solar C45 compressors;
- one Solar Mars 100 natural gas-fired turbine (about 16,601 hp), coupled with one Solar C65 compressor;
- two natural gas-fired emergency generators (1,468 hp each);
- one condensate storage tank;
- one wastewater storage tank;
- one wastewater sump;
- three building heaters; and
- equipment fugitive emissions, including blowdown emissions.

The new compressor turbines would be equipped with low NO_X combustors to limit emissions of NO_X, CO, and other pollutants generated during combustion. Midship Pipeline submitted an air construction permit application for the proposed Calumet Compressor Station in May 2017. Annual facility potential-to-emit is summarized in table 4.11.1-2.

TABLE 4.11.1-2

Summary of Pollutant Potential Emissions from the Calumet Compressor Station

	Emissions (PTE, tpy)							
Facility Component	NO_X	CO	VOC	PM_{10}/ $PM_{2.5}$	SO_2	Individual HAP [a]	Total HAPs	CO_2e
Centaur 50 Turbine 1	12.8	7.7	1.5	3.2	5.8	0.2	0.2	24,901
Centaur 50 Turbine 2	12.8	7.7	1.5	3.2	5.8	0.2	0.2	24,901
Mars 100 Turbine	18.8	17.3	3.4	7.2	13.1	0.3	0.5	56,246
Emergency Generators (2)	0.6	1.3	0.3	<0.1	<0.1	0.1	0.1	118
Wastewater Tank	–	–	<0.1	–	–	–	–	–
Wastewater Sump	–	–	<0.1	–	–	–	–	–
Condensate Tank	–	–	3.4	–	–	–	0.5	–
Truck Loading	–	–	0.2	–	–	–	<0.1	–
Turbine Startup/Shutdown	0.4	18.3	1.9	–	–	–	<0.1	155
Blowdown Events	–	–	0.8	–	–	–	<0.1	1,679
Building Heaters (3)	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	202
Fugitive Emissions	–	–	3.3	–	–	–	<0.1	559
Total Facility Emissions	45.6	52.3	16.3	13.6	24.8	0.8	1.5	108,761

[a] Largest individual HAP is formaldehyde.

Tatums Compressor Station

The Tatums Compressor Station would be in Garvin County, Oklahoma and would include the following emission generating sources:

- two Solar Taurus 70 natural gas-fired turbines (about 11,655 hp each), coupled with two Solar C45 compressors;
- one Solar Titan 130 natural gas-fired turbine (about 23,800 hp), coupled with one Solar C75 compressor;
- two natural gas-fired emergency generators (1,468 hp each);
- one condensate storage tank;
- one wastewater storage tank;
- one wastewater sump;
- three building heaters; and
- equipment fugitive emissions, including blowdown emissions.

The new compressor turbines would be equipped with low NO_X combustors to limit emissions of NO_X, CO, and other pollutants generated during combustion. Midship Pipeline submitted an air construction permit application for the proposed Tatums Compressor Station in May 2017. Annual facility potential-to-emit is summarized in table 4.11.1-3.

TABLE 4.11.1-3

Summary of Pollutant Potential Emissions from the Tatums Compressor Station

	Emissions (PTE, tpy)							
Facility Component	NO_X	CO	VOC	PM_{10}/ $PM_{2.5}$	SO_2	Individual HAP [a]	Total HAPs	CO_2e
Taurus 70 Turbine 1	20.0	12.0	2.3	5.0	9.1	0.2	0.4	38,988
Taurus 70 Turbine 2	20.0	12.0	2.3	5.0	9.1	0.2	0.4	38,988
Titan 130 Turbine	39.4	23.7	4.6	9.9	18.0	0.5	0.7	76,981
Emergency Generators (2)	0.6	1.3	0.3	<0.1	<0.1	<0.1	0.1	118
Wastewater Tank	--	--	<0.1	--	--	--	--	--
Wastewater Sump	--	--	<0.1	--	--	--	--	--
Condensate Tank	--	--	3.5	--	--	--	0.6	--
Truck Loading	--	--	0.2	--	--	--	<0.1	--
Turbine Startup and Shutdown	0.8	44.4	6.3	--	--	--	<0.1	369
Blowdown Events	--	--	0.9	--	--	--	<0.1	1,911
Building Heaters (3)	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	202
Fugitive Emissions	--	--	3.3	--	--	--	<0.1	566
Total Facility Emissions	81.0	93.4	23.7	19.9	36.2	1.0	2.2	158,123

[a] Largest individual HAP is formaldehyde.

Bennington Compressor Station

The Bennington Compressor Station would be in Bryan County, Oklahoma and would include the following emission generating sources:

- two Solar Centaur 50 natural gas-fired turbines (about 6,405 hp each), coupled with two Solar C45 compressors;
- one Solar Titan 250 natural gas-fired turbine (about 31,355 hp), coupled with one Solar C85 compressor;
- two natural gas-fired emergency generators (1,468 hp each);
- one condensate storage tank;
- one wastewater storage tank;
- one wastewater sump;
- three building heaters; and
- equipment fugitive emissions, including blowdown emissions.

The new compressor turbines would be equipped with low NO_X combustors to limit emissions of NO_X, CO, and other pollutants generated during combustion. Midship Pipeline submitted an air construction permit application for the proposed Bennington Compressor Station in May 2017. Annual facility potential-to-emit is summarized in table 4.11.1-4.

TABLE 4.11.1-4

Summary of Pollutant Potential Emissions from the Bennington Compressor Station

	Emissions (PTE, tpy)							
Facility Component	NO_X	CO	VOC	PM_{10}/ $PM_{2.5}$	SO_2	Individual HAP [a]	Total HAPs	CO_2e
Centaur 50 Turbine 1	13.2	7.9	1.5	3.3	6.0	0.2	0.2	25,765
Centaur 50 Turbine 2	13.2	7.9	1.5	3.3	6.0	0.2	0.2	25,765
Titan 250 Turbine	49.3	29.6	5.8	12.3	22.5	0.6	0.8	96,225
Emergency Generators (2)	0.6	1.3	0.3	<0.1	<0.1	<0.1	0.1	118
Wastewater Tank	–	–	<0.1	–	–	–	–	–
Wastewater Sump	–	–	<0.1	–	–	–	–	–
Condensate Tank	–	–	3.5	–	–	–	0.6	–
Truck Loading	–	–	0.2	–	–	–	<0.1	–
Turbine Startup and Shutdown	0.5	12.7	1.5	–	–	–	<0.1	245
Blowdown Events	–	–	1.1	–	–	–	<0.1	2,339
Building Heaters (3)	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	202
Fugitive Emissions	–	–	3.3	–	–	–	<0.1	559
Total Facility Emissions	77.0	59.4	18.7	18.9	34.5	1.0	1.9	151,218

[a] Largest individual HAP is formaldehyde.

Sholem Booster Station

The Sholem Booster Station would be in Stephens County, Oklahoma and would include the following emission generating sources:

- two Caterpillar G3516J reciprocating compressor engines (1,380 hp each), coupled with two Ariel JGT/4 compressors;
- one condensate storage tank;
- one wastewater storage tank;
- one wastewater sump; and
- equipment fugitive emissions, including blowdown emissions.

Midship Pipeline submitted an air construction permit application for the proposed Sholem Booster Station in May 2017, and a permit was received from the ODEQ in August 2017. Annual facility potential-to-emit is summarized in table 4.11.1-5.

TABLE 4.11.1-5

Summary of Pollutant Potential Emissions from the Sholem Booster Station

	Emissions (PTE, tpy)							
Facility Component	NO_X	CO	VOC	PM_{10}/ $PM_{2.5}$	SO_2	Individual HAP [a]	Total HAPs	CO_2e
Caterpillar G3516J Compressor Engine 1	6.7	26.6	6.4	0.4	1.3	5.7	5.8	5,267
Caterpillar G3516J Compressor Engine 2	6.7	26.6	6.4	0.4	1.3	5.7	5.8	5,267
Wastewater Tank	--	--	<0.1	--	--	--	--	--
Wastewater Sump	--	--	<0.1	--	--	--	--	--
Condensate Tank	--	--	3.5	--	--	--	--	--
Truck Loading	--	--	0.2	--	--	--	<0.1	--
Compressor Engine Startup	0.2	1.1	0.2	<0.1	<0.1	0.2	0.2	198
Blowdown Events	--	--	<0.1	--	--	--	<0.1	22
Fugitive Emissions	--	--	<0.1	--	--	--	<0.1	33
Total Facility Emissions	13.6	54.3	16.7	0.9	2.7	11.6	11.8	10,787

[a] Largest individual HAP is formaldehyde.

Meter Stations

The project would involve the installation of ten new meter stations, which would contain meter runs with gas flow meters, regulator runs with flow and pressure-control valves for measuring and controlling gas flow and regulating gas pressures, isolation block valves, and associated instrumentation/controls. Piping and valves would generate a small amount of air emissions during meter station operation. No natural gas-fired heaters would be utilized at the meter stations. The estimated annual emissions associated with each of the nine meter stations are presented in table 4.11.1-6. As noted in section 4.11.1.2, the meter stations are exempt from ODEQ air permitting requirements.

TABLE 4.11.1-6

Summary of Pollutant Potential Emissions from Meter Stations

Meter Station	Emissions (PTE, tpy)						
	NO_X	CO	VOC	PM_{10}/$PM_{2.5}$	SO_2	Total HAPs	CO_2e
Okarche/MarkWest Meter Station [a]	--	--	<0.1	--	--	<0.1	65
Canadian Valley Meter Station	--	--	<0.1	--	--	<0.1	33
Cana Meter Station	--	--	<0.1	--	--	<0.1	33
Iron Horse Meter Station			<0.1			<0.1	33
Grady Meter Station	--	--	<0.1	--	--	<0.1	33
NGPL 801 Meter Station	--	--	<0.1	--	--	<0.1	33
NGPL Meter Station	--	--	<0.1	--	--	<0.1	33
Bennington Meter Station [b]	--	--	<0.1	--	--	<0.1	98
Chisholm Meter Station	--	--	<0.1	--	--	<0.1	33
Velma Meter Station	--	--	<0.1	--	--	<0.1	33

[a] The Okarche/MarkWest Meter Station consists of both the Okarche and MarkWest meters at the same location.
[b] The Bennington Meter Station consists of the MEP and Gulf Crossing meters.
Note: The NGPL Meter Station is within the Bennington Compressor Station site.

Pipeline Operation Emissions

Operation of the pipeline would result in additional fugitive emissions from the pipeline segments. Blowdown emissions for compressor station operation are included in fugitive emission estimates associated with the compressor stations. A summary of fugitive emissions associated with operation of the pipeline facilities is presented in table 4.11.1-7. Midship Pipeline anticipates that pipeline blowdown would not occur more than once per year. Blowdown of the entire pipeline sections would only be required in the event of damage to the pipeline.

TABLE 4.11.1-7

Summary of Emissions from MIDSHIP Project Pipeline Operation

Pipeline Emissions	Emissions (PTE, tpy)						
	NO_X	VOC	CO	SO_2	$PM_{10}/PM_{2.5}$	Total HAP [a]	CO_2e
Blowdown	--	0.1	--	--	--	<0.1	269
Pipeline Fugitive Emissions	--	<0.1	--	--	--	<0.1	228
Total	--	0.2	--	--	--	<0.1	497

[a] HAPs include benzene, toluene, ethylbenzene, and xylenes.

Operational Air Quality Impact Analysis

Midship Pipeline performed an assessment of potential ambient air quality impacts from the operational emissions associated with the project at the Calumet, Tatums, and Bennington Compressor Stations and at the Sholem Booster Station using the most recent version of the EPA regulatory air dispersion model AERMOD. The analysis includes modeled concentrations of emissions associated with the project, as well as background ambient air quality concentrations taken from EPA regional air quality monitoring stations, and a comparison to the NAAQS. Results from the AERMOD analysis for the Calumet, Tatums, and Bennington Compressor Stations and the Sholem Booster Station are summarized in table 4.11.1-8.

The results of the air quality modeling analyses presented in table 4.11.1-8 demonstrate that emissions from the Calumet, Tatums, and Bennington Compressor Stations and the Sholem Booster Station, when combined with background air quality concentrations, would be below the NAAQS.

TABLE 4.11.1-8

Air Quality Modeling Analysis for Compressor Stations and Booster Station

Facility/Pollutant	Averaging Period	Modeled Concentration ($\mu g/m^3$)	Regional Ambient Background ($\mu g/m^3$) [a]	Total Concentration (Regional Background) ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
Calumet Compressor Station					
NO_2	1-hour	35.0	75.5	110.5	188.7
	Annual	3.4	8.5	11.9	100
SO_2	1-hour	17.0	7.8	24.8	196
	3-hour	22.7	7.8	30.5	1,310
CO	1-hour	987.4	1,955	2,942.4	40,000
	8-hour	1,032.2	1,031	2,063.2	10,000
PM_{10}	24-hour	6.1	88	94.1	150
$PM_{2.5}$	24-hour	4.3	21	25.3	35
	Annual	0.8	8.3	9.1	12
Tatums Compressor Station					
NO_2	1-hour	47.8	75.5	123.3	188.7
	Annual	2.5	8.5	11.0	100
SO_2	1-hour	22.6	7.8	30.4	196
	3-hour	32.5	7.8	40.3	1,310
CO	1-hour	2,100.4	1,955	4,055.4	40,000
	8-hour	1,743.7	1,031	2,774.7	10,000
PM_{10}	24-hour	6.4	88	94.4	150
$PM_{2.5}$	24-hour	3.3	21	24.3	35
	Annual	0.6	8.3	8.9	12
Bennington Compressor Station					
NO_2	1-hour	36.3	75.5	111.8	188.7
	Annual	1.4	8.5	9.9	100
SO_2	1-hour	18.9	7.8	26.7	196
	3-hour	23.4	7.8	31.2	1,310
CO	1-hour	970.6	1,955	2,925.6	40,000
	8-hour	961.0	1,031	1,992.0	10,000
PM_{10}	24-hour	4.4	88	92.4	150
$PM_{2.5}$	24-hour	2.1	21	23.1	35
	Annual	0.3	8.3	8.6	12
Sholem Booster Station					
NO_2	1-hour	91.9	75.5	167.4	188.7
	Annual	13.5	8.5	22.0	100
SO_2	1-hour	19.1	7.8	26.9	196
	3-hour	17.9	7.8	25.7	1,310
CO	1-hour	428.5	1,955	2,383.5	40,000
	8-hour	333.0	1,031	1,364.0	10,000
PM_{10}	24-hour	4.6	88	92.6	150
$PM_{2.5}$	24-hour	3.3	21	24.3	35
	Annual	0.9	8.3	9.2	12

Note: $\mu g/m^3$ = micrograms per cubic meter

[a] EPA, 2017g.

These operational emissions would occur over the life of the project and would result in long-term impacts on air quality in the project vicinity. Based on the air quality modeling analysis and with the mitigation measures proposed by Midship Pipeline, air quality impacts from operation of the project, although long-term, would not result in a significant impact on local and regional air quality.

4.11.1.4 Radon Exposure

We received one comment on the draft EIS about the risk of potential exposure to released radon gas. Radon is a naturally occurring radioactive gas that is odorless and tasteless. While radon is inert, long-term (chronic) exposure to its decay products (progeny) can be carcinogenic (lung cancer), with increased risk to smokers. Radon gas within the pipeline would be reduced through processing to make the gas pipeline quality and, in the unlikely event of a pipeline rupture, radon gas would rapidly dissipate to the atmosphere. Therefore, we conclude that the risk of exposure to radon gas due to proximity to the pipeline is not significant.

We have recently evaluated general background information, studies, and literature on radon in natural gas in several past project EISs.[20] Although the effects of transportation of natural gas to downstream users are outside the scope of the EIS and beyond our jurisdiction, we have provided general background and a review of the literature on radon. While FERC has no regulatory authority to set, monitor, or respond to indoor radon levels, many local, state, and federal entities (e.g., the EPA) establish and enforce radon exposure standards for indoor air. Radon can be entrained in fossil fuels including natural gas reserves. Because radon is unaffected by combustion, the use of natural gas can increase the level of radon within a home. Several factors, however, limit the exposure of the homeowner to radon from natural gas. Radon's half-life, defined as the time it takes for the compound to decay to half its initial concentration is relatively short (3.8 days). The time needed to gather, process, store and deliver natural gas allows a portion of the entrained radon to decay, thereby decreasing the amount of radon in the gas before being used in a residence. The required venting of appliance exhausts from water heaters, furnaces, and other appliances also limits potential exposure pathways to radon emissions. In addition, natural gas processing helps reduce radon concentrations in pipeline natural gas. The upstream processing that removes liquefied petroleum gas from the natural gas stream also removes radon. This is because radon and the two major components of liquefied petroleum gas, namely propane and ethane, have similar boiling points. Processing can remove an estimated 30 to 75 percent of the radon from natural gas (Johnson et al, 1973).

Radon levels in outdoor air, indoor air, soil air, and groundwater can be very different. Outdoor air radon levels range from less than 0.1 to about 30 picocuries per liter (pCi/L). The EPA identifies the average outdoor radon levels at about 0.4 pCi/L. Radon in soil air (the air that occupies the pores in soil) can range from 20 or 30 to more than 100,000 pCi/L. Most soils in the United States contain between 200 and 2,000 pCi of radon per liter of soil air. The amount of radon dissolved in groundwater can range from about 100 to nearly 3 million pCi/L (USGS, 1995). Radon in indoor air can range from less than 1 to about 3,000 pCi/L. The EPA identifies the average indoor radon level as 1.3 pCi/L. The U.S. Congress passed the Indoor Radon Abatement Act in 1988, which established the long-term goal that indoor air radon levels be equal to or better than outdoor air radon levels.

The EPA recommends that indoor radon range from 2 to 4 pCi/L and has set the indoor action level for radon at 4 pCi/L. If concentrations of radon exceed this action level, the EPA recommends remedial actions, such as improved ventilation, be implemented to reduce levels below this threshold. The radiation given off by the decay of radon is not strong enough to penetrate the skin. However, when radon is inhaled,

20 New Jersey-New York Expansion Project Final EIS (Docket No. CP11-56) issued March 2012; Rockaway Delivery Lateral and Northeast Connector Projects Final EIS (Docket Nos. CP13-36 and CP13-132) issued February 2014; the Algonquin Incremental Market Project Final EIS (Docket No. CP14-96) issued January 2015; and Atlantic Sunrise Project (Docket No. CP15-138) issued December 2016.

its radiation can affect the sensitive tissues in the lungs, leading to an increased risk of lung cancer. At the range of 4 pCi/L the EPA estimates that prolonged exposures would result in approximately 4 cases of lung cancer per 1,000 people exposed for those who have never smoked. The cancer risk is greater for those who are smokers or formerly smoked (EPA, 2016).

While the FERC has no regulatory authority to set, monitor, or respond to indoor radon levels, many local, state, and federal entities (e.g., the EPA) establish and enforce radon exposure standards. Based on the analysis above, we find that the risk of exposure to radon is not significant.

4.11.2 Noise

Construction and operation of the MIDSHIP Project would affect overall noise levels in the vicinity of project components. The ambient sound level of a region is defined by the total noise generated within the specific environment and usually comprises natural and man-made sounds. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of a day and throughout the week. This variation is caused in part by changing weather conditions and the effect of seasonal vegetation cover.

Two measurements used to relate the time-varying quality of environmental noise to its known effects on people are the equivalent sound level (L_{eq}) and the day-night sound level (L_{dn}). Sound levels, measured in decibels (dB), are perceived differently, depending on length of exposure and time of day. The L_{eq} is a sound level over a specific time period corresponding to the same sound energy as measured for an instantaneous sound level assuming it is a constant noise source. The L_{dn} takes into account the duration and time the noise is encountered. Specifically, in the calculation of the L_{dn}, late night and early morning (10:00 p.m. to 7:00 a.m.) noise exposures are increased by 10 dB to account for people's greater sensitivity to sound during nighttime hours. To account for the human ear's sensitivity to low-level noises, decibel levels are corrected using the A-weighted scale (dBA). The human ear's threshold of perception for noise change is considered to be 3 dBA; 6 dBA is clearly noticeable to the human ear, and 10 dBA is perceived as a doubling of noise.

4.11.2.1 Regulatory Noise Requirements

Federal Regulations

In 1974, the EPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (EPA, 1974). This document provides information for state and local governments to use in developing their own ambient noise standards. The EPA has determined that to protect the public from activity interference and annoyance outdoors in residential areas, noise levels should not exceed an L_{dn} of 55 dBA. We have adopted this criterion and use it to evaluate the potential noise impacts of projects at NSAs, such as residences, places of worship, schools, or hospitals. Because late night and early morning noise exposures are increased by 10 dB in the L_{dn} calculation to account for people's greater sensitivity to sound during nighttime hours, a facility that meets the 55-dBA L_{dn} limit must be designed such that actual constant noise levels on a 24-hour basis do not exceed 48.6 dBA L_{eq} at any NSA.

State and Local Regulations

Midship Pipeline did not identify any state or local-level noise regulations applicable to the MIDSHIP Project.

4.11.2.2 Noise Impacts and Mitigation

Construction Noise

Construction noise associated with the pipeline would be spread over the length of the pipeline routes and would not be concentrated at any one location for an extended period of time, except at the HDD sites. Construction noise associated with the installation of the compressor stations, booster station, and meter stations, would be concentrated in the vicinity of each site and would extend for several months, but would vary depending on the specific activities that are taking place at any given time. Construction would occur during daylight hours (i.e., 7 a.m. to 7 p.m.). Table 4.11.2-1 lists the estimated noise levels associated with construction equipment used for the project.

TABLE 4.11.2-1

Noise Levels of Major Equipment Associated with Pipeline Construction [a]

Equipment Type	Sound Levels at 50 feet (dBA)
Trucks	77
Crane	81
Roller	80
Dozer	82
Pickup trucks	55
Backhoes	78
Front Loader	79
Tractor	84
Scraper	84
Grader	85
Paver	77

[a] U.S. Department of Transportation, Federal Highway Administration, 2006.

Compressor Stations and Booster Station Construction

Midship Pipeline estimated the noise contribution of construction activities at the proposed compressor stations and booster station based on the various phases of construction. The estimated noise contribution from construction activities at the nearest NSA is presented in table 4.11.2-2. Because construction activities would occur only during daytime hours, the noise levels associated with construction activities are presented as an L_{eq}. The existing ambient sound level at each of the NSAs is also presented for comparison.

As presented in table 4.11.2-2, site construction noise associated with the construction of the new compressor stations and booster station would result in perceptible noise at the nearest NSAs. However, because construction activities would be limited to daytime hours, noise associated with construction of the compressor stations and booster station would have a minimal effect on nearby NSAs.

TABLE 4.11.2-2

Compressor Stations and Booster Station Construction Noise Estimates

Compressor or Booster Station	Nearest NSA (feet)	Existing Daytime L_{eq} (dBA)	Sound Contribution by Construction Activity L_{eq} (dBA) [a]				
			Site Clearing	Excavation	Foundations	Building Construction	Finishing
Calumet Compressor Station	2,200	38	47	52	40	47	52
Tatums Compressor Station	3,900	31	39	44	32	39	44
Bennington Compressor Station	1,700	44	50	55	43	50	55
Sholem Booster Station	1,400	44	47	52	40	47	52

[a] Bolt, Beranek, and Newman, Inc., 1971.

Horizontal Directional Drill Locations

Midship Pipeline proposes to use the HDD method at 13 locations:

- North Canadian River;
- Interstate 40 (Historic Route 66)/Tributary to the North Canadian River;
- Canadian River;
- Oklahoma, Kansas and Texas Railroad;
- Washita River Crossing 1;
- Wildhorse Creek;
- Henry House Creek;
- Washita River Crossing 2;
- Pennington Creek;
- Blue River;
- Rock Creek;
- Velma PFO; and
- State Highway 76 HDD.

Eleven of the 13 HDD sites have NSAs within 0.5 mile of either the entry or exit point. Midship Pipeline estimated background ambient sound levels at these 11 locations using published ambient sound levels based on land use type. Table 4.11.2-3 summarizes the estimated ambient sound levels at the nearest NSA to each proposed HDD entrance and exit location. Because there are no NSAs within 0.5 mile of the Canadian River and Wildhorse Creek HDD entry or exit sites, the noise associated with those HDD operations would not have an impact on NSAs and are not analyzed further in this EIS.

HDD activities at each site are estimated to be completed over a 5 to 8 week period, with the exception of the Pennington Creek and Rock Creek HDD sites, which may require 3 to 4 months to complete, depending on actual drilling conditions encountered. Midship Pipeline's HDD Plan indicates that HDD operating hours would generally be during daylight hours, 10 to 12 hours per day, 6 days per week. However, Midship Pipeline would conduct 24-hour HDD work when the pipe is being pulled into the hole. The HDD pullback is estimated to take one to several days depending on the length of the proposed HDD.

HDD activities involve a variety of equipment at the entrance and exit sides that would generate noise, including drilling rigs, diesel generators, and excavators. Midship Pipeline conducted a noise impact

assessment for the nearest NSAs within a 0.5-mile radius of the entry points and exit points of the eleven applicable HDD sites assuming HDD activities are continuous and extend through the night. Where noise attributable to HDD activities at the nearest NSA exceeded 55 dBA L_{dn}, Midship Pipeline proposed noise mitigation measures; where noise attributable to HDD activities at the nearest NSA was estimated to be less than 55 dBA L_{dn}, no specific noise mitigation measures were proposed. The results of this assessment are presented in table 4.11.2-3.

TABLE 4.11.2-3

Noise Assessments for Horizontal Directional Drill Entry and Exit Sites Associated with the MIDSHIP Project

HDD Crossing	Milepost (Begin/End)	Distance (feet) and Direction of Closest NSA to Entry Point	Distance (feet) and Direction of Closest NSA to Exit Point	Land Use Type	Estimated Ambient L_{dn} (dBA)	Site-Specific Mitigation Required (Yes/No)	Calculated L_{dn} Due to HDD (dBA) at Closest NSA	L_{dn} of HDD + Ambient (dBA) at Closest NSA	Increase Above Ambient at Closest NSA (dB)
North Canadian River [a]	7.6/7.8	1,450/ Southeast	2,100/South	5	47	Yes	52	53	6
Interstate 40 (Hist. Rte. 66)/Trib. to the North Canadian River	15.6/15.9	1,900/South	2,850/South	2	62	No	53	63	1
Oklahoma, Kansas and Texas Railroad [a]	28.0/28.7	1,800/North	700/North	4	52	Yes	49	52	0
Washita River 1	36.7/37.0	2,700/ Southwest	780/ Northeast	5	47	No	53	54	7
Henry House Creek	64.6/64.9	1,600/ Southwest	1,600/ Southeast	5	47	No	55	56	4
Washita River 2	99.9/100.2	1,600/South	1,400/ Southeast	4	52	No	55	56	4
Pennington Creek [a]	119.7/120.0	250/ Southwest	1,100/ Southwest	4	52	Yes	57	57	5
Blue River [a]	135.4/135.7	500/South	1,900/West	4	52	Yes	50	50	0
Rock Creek [b]	151.5/152.1	1,100/North	650/ Northeast	5	47	Yes	59	59	12
Velma PFO	VE9.4/VE9.5 [c]	1,100/North	1,300/ Northeast	5	47	No	54	55	8
State Highway 76	VE11.4/ VE11.5 [c]	1,150/ Northwest	780/North	5	47	No	51	52	5

[a] Noise estimates include the use of sound barriers.

[b] Midship Pipeline has indicated that temporary sound barriers would be used at the Rock Creek HDD site and estimated at least a 4 dB sound reduction. Noise estimates do not include the sound reduction due to the use of sound barriers.

[c] Mileposts along the Velma Lateral.

Notes:

Land Use Types

2 Moderate Commercial and Industrial Areas, Noisy Residential Areas, and Heavy Traffic Areas

4 Quiet Urban and Normal Residential Areas

5 Quiet Suburban Residential Areas

The results of the noise assessments indicate that the estimated noise attributable to HDD equipment operations would meet our noise criteria of 55 dBA L_{dn} at the nearest NSA at the Interstate 40 (Historic Route 66)/Tributary to the North Canadian River, Washita River 1, Henry House Creek, Washita River 2 HDD, Velma PFO, and State Highway 76 entry and exit locations without the need for any site-specific noise mitigation measures. Without any site-specific mitigation measures, the noise levels

attributable to the HDD activities at the North Canadian River, Oklahoma, Kansas and Texas Railroad; Pennington Creek; Blue River; and Rock Creek HDD entry and exit locations would exceed our noise criteria of 55 dBA L_{dn} at the nearest NSA. Midship Pipeline proposed to construct a temporary sound wall at these five HDD locations to lower noise associated with HDD activities at the nearby NSAs. Additional potential mitigation measures that could be implemented by Midship Pipeline include:

- reconfiguring equipment locations to take advantage of natural and artificial noise barriers;
- using residential-grade silencers or mufflers on engines;
- using noise-dampening blankets, acoustical tents, or other acoustical barriers;
- employing low-noise generators; and
- offering temporary relocation to NSAs within 0.5 mile.

Based on this information, and with the implementation of the additional noise mitigation measures outlined above, the estimated noise attributable to HDD equipment operations would meet our noise criteria of 55 dBA L_{dn} at the nearest NSAs at all of the HDD locations with the exception of the Pennington Creek HDD. At the Pennington Creek HDD, Midship Pipeline has committed to adding a temporary sound wall. With the addition of a temporary sound wall, the noise attributable to HDD activities at the nearest NSA at the Pennington Creek crossing would be 57 dBA L_{dn}. Midship Pipeline has indicated that no additional noise mitigation measures are feasible to lower the noise levels to below our criteria of 55 dBA L_{dn}. We have reviewed the proposed activities and determined that the proposed mitigation is reasonable and that the noise attributable to the HDD activities would have a moderate but short-term impact on NSAs in the vicinity of the Pennington Creek HDD.

For several of the HDD locations requiring noise mitigation (i.e., North Canadian River; Oklahoma, Kansas and Texas Railroad; Blue River; and Rock Creek HDD), Midship Pipeline indicated it would identify the specific noise mitigation measures it would implement at each site once detailed design of the HDDs is complete. To ensure that the proposed site-specific noise mitigation measures would effectively reduce noise attributable to HDD activities at the nearest NSAs to levels consistent with Midship Pipeline's estimates, **we recommend that:**

- **Prior to construction of the North Canadian River; Oklahoma, Kansas and Texas Railroad; Blue River; and Rock Creek HDDs, Midship Pipeline should file with the Secretary, for review and written approval by the Director of OEP, an HDD noise mitigation plan to reduce the projected noise level attributable to the proposed drilling operations at NSAs with predicted noise levels above 55 dBA. During drilling operations, Midship Pipeline should implement the approved plan, monitor noise levels, and make all reasonable efforts to restrict the noise attributable to the drilling operations to no more than 55 dBA L_{dn} at the NSAs.**

Where continuous hours of operations are required, Midship Pipeline would work with homeowners in the vicinity of the drilling operations who may be disturbed by the work to come up with a workable situation to alleviate the landowner's concerns.

Operational Noise

We received comments from nearby residents expressing concern about operational noise from the proposed compressor stations (in particular, the Tatums Compressor Station). Noise impacts associated with the operation of the proposed compressor stations and associated mitigation measures are discussed below.

Calumet Compressor Station

The proposed Calumet Compressor Station would be in Canadian County, Oklahoma. The area surrounding the proposed compressor station site is primarily agricultural land, with natural gas infrastructure immediately adjacent to the site. Midship Pipeline conducted a noise survey in the vicinity of the proposed compressor station site on January 17 to 18, 2017. Existing ambient noise measurements were collected at five nearby NSAs which are provided in table 4.11.2-4. The distance and direction of these NSAs from the proposed compressor station location are depicted on figure 4.11.2-1 in appendix K.

The Calumet Compressor Station would involve the installation of the following major noise-generating equipment, which would operate on a continuous basis:

- two Solar Centaur 50 combustion turbines;
- two Solar C45 compressors;
- one Solar Mars 100 combustion turbine;
- one Solar C65 compressor;
- three gas coolers (four bays in total); and
- three lube oil coolers.

The combustion turbines and compressors would be inside a building. Noise control features that would be included in the compressor station include:

- acoustical building for the combustion turbines and gas compressors;
- exhaust stack silencers;
- combustion air intake silencers; and
- acoustically treated building wall and roof fan openings.

Table 4.11.2-4 summarizes the estimated sound contribution of the compressor station at the nearby NSAs, taking into account the proposed noise mitigation measures.

TABLE 4.11.2-4

Noise Assessment for the Calumet Compressor Station

Nearby NSAs	Distance (feet) and Direction of NSA	Existing Ambient L_{dn} (dBA)	Estimated L_{dn} of Compressor Station (dBA)	Combined Future L_{dn} (Compressor Station + Ambient) (dBA)	Potential Noise Increase [a] (dB)
NSA 1	2,200/Southwest	40.9	45.2	46.6	5.7
NSA 2	5,600/North	50.1	34.4	50.2	0.1
NSA 3	4,700/Northeast	51.2	35.3	51.3	0.1
NSA 4	4,700/Southeast	41.2	37.3	42.7	1.5
NSA 5	6,300/West	42.8	33.0	43.2	0.4

[a] Assumes operational noise control measures detailed above have been implemented.

As shown in table 4.11.2-4, predicted noise levels attributable to the operation of the Calumet Compressor Station are expected to be below 55 dBA L_{dn}. The increase in noise at NSA 1 would be greater than 3 dBA and thus may be perceptible to the human ear; however, the noise increase at all other NSAs would likely be imperceptible to the human ear. Midship Pipeline has indicated that the final design of the Calumet Compressor Station may not include all of the mitigation measures assumed in the noise analysis or may include other types of mitigation measures. We have included a recommendation at the end of this section to ensure that the final noise mitigation measures implemented at the Calumet Compressor Station would result in operational noise levels at or below our noise criteria.

Tatums Compressor Station

The proposed Tatums Compressor Station would be in Garvin County, Oklahoma. The area surrounding the proposed compressor station site is largely undeveloped and/or agricultural land. Midship Pipeline conducted a noise survey in the vicinity of the proposed compressor station site on January 18 to 19, 2017. Existing ambient noise measurements were collected at five nearby NSAs which are provided in table 4.11.2-5. The distance and direction of these NSAs from the proposed compressor station location are depicted on figure 4.11.2-2 in appendix K.

TABLE 4.11.2-5

Noise Assessment for the Tatums Compressor Station

Nearby NSAs	Distance and Direction of NSA	Existing Ambient L_{dn} (dBA)	Estimated L_{dn} of Compressor Station (dBA)	Combined Future L_{dn} (Compressor Station + Ambient) (dBA)	Potential Noise Increase [a] (dB)
NSA 1	3,900/West	38.7	44.8	45.8	7.1
NSA 2	6,000/Northwest	39.6	39.0	42.3	2.7
NSA 3	7,200/Northeast	33.5	34.6	37.1	3.6
NSA 4	6,000/Southeast	34.1	35.6	37.9	3.8
NSA 5	6,200/Southwest	36.8	36.5	39.7	2.9

[a] Assumes operational noise control measures detailed above have been implemented.

The Tatums Compressor Station would involve the installation of the following major noise-generating equipment, which would operate on a continuous basis:

- two Solar Taurus 70 combustion turbines;
- two Solar C45 compressors;
- one Solar Titan 130 combustion turbine;
- one Solar C75 compressor;
- three gas coolers (seven bays in total); and
- three lube oil coolers.

The combustion turbines and compressors would be inside a building. Noise control features that would be included in the compressor station include:

- acoustical building for the combustion turbines and gas compressors;
- exhaust stack silencers;

- combustion air intake silencers; and
- acoustically treated building wall and roof fan openings.

Table 4.11.2-5 summarizes the estimated sound contribution of the compressor station at the nearby NSAs, taking into account the proposed noise mitigation measures.

As shown in table 4.11.2-5, predicted noise levels attributable to the operation of the Tatums Compressor Station are expected to be below 55 dBA L_{dn}. The increase in noise at three of the nearby NSAs would be greater than 3 dBA and thus may be perceptible to the human ear. Midship Pipeline has indicated that the final design of the Tatums Compressor Station may not include all of the mitigation measures assumed in the noise analysis or may include other types of mitigation measures. We have included a recommendation at the end of this section to ensure that the final noise mitigation measures implemented at the Tatums Compressor Station would result in operational noise levels at or below our noise criteria.

Bennington Compressor Station

The proposed Bennington Compressor Station would be in Bryan County, Oklahoma. The area surrounding the proposed compressor station site is largely agricultural land. Midship Pipeline conducted a noise survey in the vicinity of the proposed compressor station site on January 19 to 20, 2017. Existing ambient noise measurements were collected at six nearby NSAs, which are provided in table 4.11.2-6. The distance and direction of these NSAs from the proposed compressor station location are depicted on figure 4.11.2-3 in appendix K.

TABLE 4.11.2-6

Noise Assessment for the Bennington Compressor Station

Nearby NSAs	Distance and Direction of NSA	Existing Ambient L_{dn} (dBA)	Estimated L_{dn} of Compressor Station (dBA)	Combined Future L_{dn} (Compressor Station + Ambient) (dBA)	Potential Noise Increase [a] (dB)
NSA 1	1,700/Southwest	45.2	47.6	49.8	4.4
NSA 2	2,300/Northwest	42.7	44.4	46.6	3.9
NSA 3	3,600/North	42.2	40.6	44.5	2.3
NSA 4	5,400/Northeast	50.6	36.9	50.8	0.2
NSA 5	4,900/East	53.4	36.2	53.5	0.1
NSA 6	5,500/South	42.7	35.6	43.5	0.8

[a] Assumes operational noise control measures detailed above have been implemented.

The Bennington Compressor Station would involve the installation of the following major noise-generating equipment, which would operate on a continuous basis:

- two Solar Centaur 50 combustion turbines;
- two Solar C45 compressors;
- one Solar Titan 250 combustion turbine;
- one Solar C85 compressor;
- three gas coolers (six bays in total); and
- three lube oil coolers.

The combustion turbines and compressors would be inside a building. Noise control features that would be included in the compressor station include:

- acoustical building for the combustion turbines and gas compressors;
- exhaust stack silencers;
- combustion air intake silencers; and
- acoustically treated building wall and roof fan openings.

Table 4.11.2-6 summarizes the estimated sound contribution of the compressor station at the nearby NSAs, taking into account the proposed noise mitigation measures.

As shown in table 4.11.2-6, predicted noise levels attributable to the operation of the Bennington Compressor Station are expected to be below 55 dBA L_{dn}. The increase in noise at NSAs 1 and 2 would be greater than 3 dBA and thus may be perceptible to the human ear; however, the noise increase at all other NSAs would likely be imperceptible to the human ear. Midship Pipeline has indicated that the final design of the Bennington Compressor Station may not include all of the mitigation measures assumed in the noise analysis or may include other types of mitigation measures. We have included a recommendation at the end of this section to ensure that the final noise mitigation measures implemented at the Bennington Compressor Station would result in operational noise levels at or below our noise criteria.

Sholem Booster Station

The proposed Sholem Booster Station would be in Stephens County, Oklahoma. The area surrounding the proposed booster station site is largely open land with oil and gas wells and infrastructure in proximity to the site. Midship Pipeline conducted a noise survey in the vicinity of the proposed booster station site on April 19 to 20, 2017. Existing ambient noise measurements were collected at four nearby NSAs, which are provided in table 4.11.2-7. The distance and direction of these NSAs from the proposed booster station location are depicted on figure 4.11.2-4 in appendix K.

TABLE 4.11.2-7

Noise Assessment for the Sholem Booster Station

Nearby NSAs	Distance and Direction of NSA	Existing Ambient L_{dn} (dBA)	Estimated L_{dn} of Booster Station (dBA)	Combined Future L_{dn} (Booster Station + Ambient) (dBA)	Potential Noise Increase [a] (dB)
NSA 1	1,100/Southwest	49.9	48.3	52.2	2.3
NSA 2	3,100/South	47.3	41.7	48.4	1.1
NSA 3	1,700/Southeast	47.8	47.6	50.7	2.9
NSA 4	2,100/Southwest	47.8	42.4	48.9	1.1

[a] Assumes operational noise control measures detailed above have been implemented.

The Sholem Booster Station would involve the installation of the following major noise-generating equipment, which would operate on a continuous basis:

- two Caterpillar G3516J engines;
- two Ariel JGT/4 compressors;
- two gas coolers;

- suction and discharge headers; and
- aboveground piping.

Noise control features that would be included in the booster station include:

- acoustical building for the engines and compressors;
- exhaust stack silencers; and
- acoustical lagging for the suction and discharge headers.

Table 4.11.2-7 summarizes the estimated sound contribution of the booster station at the nearby NSAs, taking into account the proposed noise mitigation measures.

As shown in table 4.11.2-7, predicted noise levels attributable to the operation of the Sholem Booster Station are expected to be at or below 55 dBA L_{dn}. The increase in noise at all of the NSAs would be less than 3 dBA and thus is unlikely to be perceptible to the human ear. Midship Pipeline has indicated that the final design of the Sholem Booster Station may not include all of the mitigation measures assumed in the noise analysis or may include other types of mitigation measures. We have included a recommendation at the end of this section to ensure that the final noise mitigation measures implemented at the Sholem Booster Station would result in operational noise levels at or below our noise criteria.

To ensure that the actual noise produced as a result of the operation of the Calumet, Tatums, and Bennington Compressor Stations and the Sholem Booster Station meets our criteria, **we recommend that:**

- **Midship Pipeline should file noise surveys with the Secretary no later than 60 days after placing the Calumet, Tatums, and Bennington Compressor Stations and the Sholem Booster Station in service. If a full load condition noise survey is not possible, Midship Pipeline should provide an interim survey at the maximum possible horsepower load and provide the full load survey within 6 months. If the noise attributable to the operation of any of the compressor or booster stations under interim or full horsepower load conditions exceeds an L_{dn} of 55 dBA at any nearby NSAs, Midship Pipeline should file a report on what changes are needed and should install the additional noise controls to meet the level within 1 year of the in-service date. Midship Pipeline should confirm compliance with the above requirement by filing a second noise survey with the Secretary no later than 60 days after it installs the additional noise controls.**

Meter Stations

Midship Pipeline proposes to construct ten new meter stations. The following six proposed new meter stations do not have NSAs within 0.5 mile of the station:

- Canadian Valley Meter Station;
- Cana Meter Station;
- Iron Horse Meter Station;
- Grady Meter Station;
- NGPL 801 Meter Station; and
- NGPL Meter Station.

Because these six meter stations do not have NSAs within 0.5 mile of the site, the noise associated with the operation of these stations would not have an impact on NSAs. Therefore, the noise associated with these stations is not analyzed further in this EIS.

Four of the proposed new meter station sites would have NSAs within 0.5 mile of the station:

- Chisholm Meter Station;
- Okarche/MarkWest Meter Station;
- Velma Meter Station; and
- Bennington Meter Station.

Midship Pipeline estimated background ambient sound levels at the four meter stations with NSAs within 0.5 mile of the station using published ambient sound levels based on land use type. Table 4.11.2-8 summarizes the estimated ambient sound levels at the NSAs in proximity to these four proposed meter stations.

TABLE 4.11.2-8

Noise Assessment for Meter Stations

Facility	Distance and Direction of Closest NSA	Existing Ambient L_{dn} (dBA) [a]	Calculated L_{dn} of Meter Station (dBA)	Estimated Total L_{dn} (Regulator Station Noise + Ambient) (dBA)	Noise Increase Above Ambient [a] (dB)
Chisholm Meter Station	1,200/West	57	40	57	0
Okarche/MarkWest Meter Station	2,700/Southeast	47	37	47	0
Velma Meter Station	500/Northeast	57	50	58	1
Bennington Meter Station	2,200/South-southeast	52	52	55	3

[a] ANSI, 1993.

Noise at the proposed meter stations would be mainly generated by control valves and ultrasonic meters. The predicted sound contribution of each of the other two meter stations was performed only for the closest NSAs because the sound contribution at other more distant NSAs would be less than the sound contribution at the closest NSAs.

Table 4.11.2-8 summarizes the estimated sound level contribution (i.e., L_{dn}, as calculated from the estimated A-weighted sound level) for each meter station at the closest NSAs assuming expected maximum operating conditions.

The results of the noise analysis indicate that the sound attributable to each meter station would be lower than 55 dBA at the nearby NSAs.

Midship Pipeline indicated that the design of the meter stations has been revised since the noise analyses presented in the draft EIS were completed. The design changes involve the size and number of flow control valves at each of the ten meter stations. Based on manufacturer noise estimates, the noise associated with operation of the new flow control valves would be less than or equal to the noise associated with the flow control values assumed in the original estimates of noise associated with operation of the meter stations. Therefore, no updates to the noise estimates presented in table 4.11.2-8 are required based upon these modifications.

Compressor Station Blowdown Noise

Compressor unit blowdowns would occur as part of normal compressor station operation. Blowdowns are temporary events of short duration. Midship Pipeline has committed to affixing silencers at each compressor station site to ensure that noise associated with blowdown events would be less than 55 dBA L_{dn} at nearby NSAs.

Conclusion

Construction of the project would temporarily affect noise levels; however, noise from pipeline construction would be spread over the length of the pipeline routes and would not be concentrated at any one location for an extended period of time except at the HDD sites. Noise from construction of aboveground facilities would be localized in the vicinity of each site and limited to the duration of construction. Because pipeline and aboveground facility construction would occur during daytime hours, the noise impact associated with these activities would not have a significant effect on nearby NSAs. HDD activities may occur continuously; however, with the implementation of mitigation measures proposed by Midship Pipeline and our recommendation, we conclude that the noise impacts associated with HDD activities would be moderate and are appropriately mitigated.

Operation of the project would have a long-term effect on noise levels in proximity to the proposed compressor stations, booster station, and meter stations. The noise associated with these facilities is likely to be perceptible at some nearby NSAs; however, Midship Pipeline has proposed mitigation measures at the compressor stations and booster stations to minimize continuous noise levels from these facilities at nearby NSAs. Further, our recommendation will ensure that noise levels at Midship Pipeline's proposed compressor and booster stations would not exceed 55 dBA L_{dn}. Therefore, we conclude that the noise impacts associated with operation of the project activities would not be significant and are appropriately mitigated.

4.12 RELIABILITY AND SAFETY

The reliability and safety analysis addresses the potential hazard to the public from failure of project components resulting from accidents, natural catastrophes, or acts of terrorism and describes how the project facilities would be designed, constructed, operated, and maintained to minimize these potential hazards. The transportation of natural gas by pipeline involves some incremental risk to the public due to the potential for accidental release of natural gas. The greatest hazard is a fire or explosion following a major pipeline rupture.

Methane, the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic and is inactive biologically, but is classified as a simple asphyxiate, possessing a slight inhalation hazard. If inhaled in high concentration, oxygen deficiency can result in serious injury or death. We received comments concerning health impacts from methane and other gases, such as benzene and hydrogen sulfide, if there was a release of natural gas to the atmosphere. Methane is not listed in the International Agency for Research on Cancer, National Toxicology Program, or by the Occupational Safety and Health Administration as a carcinogen or potential carcinogen. Concentrations of benzene and hydrogen sulfide in pipeline gas are very low and would be unlikely to affect public health in the event of a leak. See section 4.11.1.3 for further discussion of air quality impacts associated with the project.

Methane is buoyant at atmospheric temperatures, disperses rapidly in air, has an auto-ignition temperature of 1,000 degrees °F, and is flammable at concentrations between 5 and 15 percent in the air. Unconfined mixtures of methane in air are not explosive but may ignite if there is an ignition source; however, a flammable concentration within an enclosed space in the presence of an ignition source can explode.

4.12.1 Safety Standards

The DOT is mandated to provide for pipeline safety under 49 USC 601. Within the DOT, the PHMSA, Office of Pipeline Safety administers the national regulatory program to ensure the safe transportation of natural gas and other hazardous materials by pipeline. It develops safety regulations and other approaches to risk management that ensure safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards that set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve the required safety standard.

PHMSA's mission is to protect people and the environment from the risk of pipeline incidents. Within the project area, the DOT is responsible for inspecting interstate pipeline facilities and enforcement actions. The DOT pipeline standards are published in 49 CFR 190–199. Part 192 specifically addresses natural gas pipeline safety issues.

Under a *Memorandum of Understanding on Natural Gas Transportation Facilities* (Memorandum) dated January 15, 1993, between the DOT and FERC, the DOT is recognized as having the exclusive authority to promulgate federal safety standards used in the transportation of natural gas. Section 157.14(a)(9)(vi) of FERC's regulations require that an applicant certify that it will design, install, inspect, test, construct, operate, replace, and maintain the facility for which a Certificate is requested in accordance with federal safety standards and plans for maintenance and inspection, or shall certify that it has been granted a waiver of the requirements of the safety standards by the DOT in accordance with section 3(e) of the Natural Gas Pipeline Safety Act. FERC accepts this certification and does not impose additional safety standards other than the DOT standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the Memorandum to promptly alert the DOT. The Memorandum also provides instructions for referring complaints and inquiries made by state and local governments and the general public involving safety matters related to pipelines under the Commission's jurisdiction.

FERC also participates as a member of the DOT's Technical Pipeline Safety Standards Committee, which determines if proposed safety regulations are reasonable, feasible, and practicable.

Midship Pipeline would design, construct, operate, and maintain the proposed pipeline and aboveground facilities in accordance with or in exceedance of the DOT's Minimum Federal Safety Standards in 49 CFR 192. These regulations, which are intended to protect the public and to prevent natural gas facility accidents and failures, include specifications for material selection and qualification, minimum design requirements, and protection of the pipeline from internal, external, and atmospheric corrosion. Some commentors expressed concern about the safety of pipeline operations. As stated previously, any natural gas facility has some degree of risk; however, the DOT regulations require regular inspection and maintenance, including repairs as necessary, to verify the pipeline has adequate strength and integrity to transport the natural gas safely.

The Pipeline Safety, Regulatory Certainty and Job Creation Act of 2011 (H.R. 2845), was passed by Congress and signed into law on January 3, 2012, by President Barack Obama. Among other requirements, this act mandates that within no later than 2 years of the date of enactment, after considering factors specified in the act, the DOT Secretary, if appropriate, shall require by regulation the use of automatic or remote control shut-off valves, or equivalent technology, where economically, technically, and operationally feasible on transmission pipeline facilities constructed or entirely replaced after the date on which the DOT Secretary issues the final rule containing such requirement. As required, Midship Pipeline would use remote control shut-off valves on the proposed pipeline.

The DOT defines area classifications based on population density in the vicinity of the pipeline and specifies more rigorous safety requirements for populated areas. Pipe wall thickness and pipeline design

pressures, hydrostatic test pressures, MAOP, inspection and testing of welds, and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas. The class locations unit is an area that extends 220 yards on either side of the centerline of any continuous 1-mile length of pipeline. The four area classifications are defined below:

- Class 1 – location with 10 or fewer buildings intended for human occupancy;
- Class 2 – location with more than 10 but less than 46 buildings intended for human occupancy;
- Class 3 – location with 46 or more buildings intended for human occupancy or where the pipeline lies within 100 yards of any building, or small well-defined outside area occupied by 20 or more people on at least 5 days a week for 10 weeks in any 12-month period; and
- Class 4 – location where buildings with four or more stories aboveground are prevalent.

In accordance with federal standards, class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. Pipelines constructed on land in Class 1 locations must be installed with a minimum depth of cover of 30 inches in normal soil and 18 inches in consolidated rock. Class 2, 3, and 4 locations, as well as drainage ditches of public roads and railroad crossings, require a minimum cover of 36 inches in normal soil and 24 inches in consolidated rock. Midship Pipeline would use a minimum of 5 feet of cover (18 inches in consolidated bedrock) at all waterbody crossings and Class 2 standards at road crossings (where not also crossing a railroad). Midship Pipeline would use Class 3 standards at combined road and railroad crossings and at connections at meter, compressor, and booster stations, as well as at existing gas plants. The remainder of the pipelines would be constructed and maintained to Class 1 standards.

About 1.3 miles (0.7 percent) of the Mainline would be in Class 2 areas and 198.1 miles (99.3 percent) in Class 1 areas. The entire Chisholm and Velma Laterals would be in Class 1 areas.

A summary of class locations based on current population density along the proposed pipeline routes is provided in table 4.12.1-1.

TABLE 4.12.1-1

Area Classifications Crossed by the MIDSHIP Project

Pipeline	Begin Milepost	End Milepost	Class Location
Mainline	0.0	153.9	1
	153.9	155.2	2
	155.2	199.6	1
Chisholm Lateral	0.0	20.4	1
Velma Lateral	0.0	13.6	1

Class locations also specify the maximum distance to sectionalized block valves (i.e., 10.0, 7.5, 4.0, and 2.5 miles in Class 1, 2, 3, and 4 locations, respectively). Pipe wall thickness and pipeline design pressures; hydrostatic test pressures; MAOP; inspection and testing of welds; and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas.

Midship Pipeline plans to construct sections of the project using alternative MAOPs (i.e., higher operating pressures) within Class 1 and Class 2 locations. Alternative MAOP is calculated using design factors specified in 49 CFR 192.620 and may be used if criteria described in that section have been met.

Midship Pipeline is required to notify PHMSA and the OCC Department of Pipeline Safety of the planned alternative MAOP design and operation prior to pipe manufacturing or construction activities. Midship Pipeline must also certify that the pipeline would meet the criteria in 49 CFR 192.620 and would be maintained in accordance with the additional operational and maintenance requirements detailed in 49 CFR 192. No additional permit or authorization from PHMSA would be required.

During operation of the pipeline, the operating company is required to periodically reassess the class locations along its pipelines. If a subsequent increase in population density adjacent to the right-of-way indicates a change in class location for the pipeline, Midship Pipeline would be required to reduce the MAOP or replace the segment with pipe of sufficient grade and wall thickness, if required, to comply with the DOT code of regulations for the new class location.

The Pipeline Safety Improvement Act of 2002 also requires operators to develop and follow a written integrity management program that contains all the elements described in 49 CFR 192.911 and addresses the risks on each transmission pipeline segment. Specifically, the law establishes an integrity management program that applies to all high consequence areas (HCAs).

We received comments about the potential effects of a pipeline rupture and natural gas ignition. It should be noted that if a pipeline rupture does occur, the natural gas does not necessarily ignite. However, the DOT published rules that define HCAs where a gas pipeline accident could do considerable harm to people and their property and requires an integrity management program to minimize the potential for an accident. This definition satisfies, in part, the Congressional mandate for the DOT to prescribe standards that establish criteria for identifying each gas pipeline facility in a high-density population area.

The HCAs may be defined in one of two ways. In the first method, an HCA includes:

- current Class 3 and 4 locations;
- any area in Class 1 or 2 locations where the potential impact radius[21] is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle;[22] or
- any area in Class 1 or 2 locations where the potential impact circle includes an identified site.

An identified site is:

- an outside area or open structure that is occupied by 20 or more persons on at least 50 days in any 12-month period;
- a building that is occupied by 20 or more persons on at least 5 days a week for any 10 weeks in any 12-month period; or
- a facility that is occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate (e.g., hospitals, prisons, schools, daycare facilities, retirement or assisted-living facilities).

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21 The potential impact radius is calculated as the product of 0.69 and the square root of the MAOP of the pipeline (1,480 pounds per square inch gauge) multiplied by the pipeline diameter in inches. Therefore, the potential impact radius would be 36736.2 inches, (3,064 feet) for the Mainline, 30,636 inches (2,553 feet) for the Chisholm Lateral, and 16,339.2 inches (1,361.6 feet) for the Velma Lateral.

22 The potential impact circle is a circle of radius equal to the potential impact radius.

In the second method, an HCA includes any area within a potential impact circle that contains:

- 20 or more buildings intended for human occupancy; or
- an identified site.

Once a pipeline operator has determined the HCAs along its pipeline, it must apply the elements of its integrity management plan to those segments of the pipeline within the HCAs. The DOT's regulations specify the requirements for the integrity management plan at Part 192.911. The pipeline integrity management rule for HCAs requires inspection of the pipeline every 7 years. Pipeline operators must continually monitor conditions along the pipeline. When they become aware of population or usage changes that create or change an HCA (e.g., population expands to encompass more of the area near the pipeline right-of-way), this information is factored into its integrity assessment planning, risk analysis, and consideration of the need for additional preventive and mitigative risk controls. Midship Pipeline identified HCAs based on the relationship of the pipeline centerline to other nearby structures and identified sites. Of the 233.3 miles of proposed pipeline, Midship Pipeline has identified two HCAs totaling about 1.9 miles along the mainline as shown in table 4.12.1-2. There were no HCAs identified along the Chisholm and Velma Laterals.

TABLE 4.12.1-2

High Consequence Areas Crossed by the MIDSHIP Project [a]

Pipeline	Begin Milepost	End Milepost	HCA Length (miles)
Mainline	5.7	6.1	0.4
	124.3	125.8	1.5

[a] No HCAs are crossed by the Chisholm and Velma Laterals.

We received a comment expressing concern that a 36-inch depth of cover could potentially result in pipe damage and subsequent loss of cathodic protection in croplands where deep tilling is practiced. Midship Pipeline has committed to 48 inches of cover in cropland, which should minimize the potential for damage from deep tillage.

FERC staff inquired in a data request whether Midship Pipeline is performing an alternating current (AC) mitigation study to determine locations, if any, where adjacent powerlines may affect the cathodic protection of the pipeline and whether Midship Pipeline would implement protective measures based on the results of the AC mitigation study. Midship Pipeline stated in a data response that it is contracting a geotechnical company to collect soil resistivity information and is working with power companies to collect powerline kilovolt-ampere ratings for collocated or crossed powerlines, which would be used to establish the baseline from which the cathodic protection and AC mitigation would be designed. Once the baseline is established and the designs of the transmission pipelines and underground piping for the compressor and meter stations are complete, Midship Pipeline would design the cathodic protection for the pipelines and provide to FERC the protective measures that would be used, which is anticipated to be completed in the first quarter of 2018.

We also received comments from a landowner who is concerned about the collocation of the proposed pipeline with an existing pipeline on their property and the potential for a rupture or explosion of either pipeline to cause a similar incident on the collocated pipeline. Based on the construction and design methods of pipelines collocated within a shared right-of-way, it is unlikely that one pipeline failure would cause the adjacent pipeline to also fail.

As previously described, Midship Pipeline would design and construct the project in accordance with or in exceedance of the DOT's Minimum Federal Safety Standards in 49 CFR 192. In constructing the pipeline, Midship Pipeline would use specified welding protocol and hydrostatic testing to ensure the integrity of the pipeline, and pipeline coating and cathodic protection systems[23] to meet requirements established by the DOT for protection of metallic facilities from external, internal, and atmospheric corrosion. Midship Pipeline would inspect all welds and use a non-destructive method, such as radiographic or ultrasonic inspections, to ensure pipeline structural integrity and compliance with the applicable DOT regulations. Those welds that do not meet established specifications would be repaired or replaced. Once the welds are approved, a protective coating would be applied to the welded joints and the entire pipeline would be visually inspected for any faults, scratches, or other coating defects. Any damage would be repaired before the pipeline is installed. Upon completion of construction, the integrity of the pipelines would be verified by hydrostatic testing as described in section 4.3.2.5.

During operation, the pipelines would be protected by a cathodic protection system, which would impress a low voltage current on the pipelines to offset natural soil and groundwater corrosion potential during operation. After its installation, the functional capability of the cathodic protection system would be inspected regularly to verify proper operating conditions for corrosion mitigation. Midship Pipeline indicated that it is conducting a study to determine whether there are any locations along the proposed pipeline routes where adjacent powerlines might affect the cathodic protection of the pipeline and would implement protective measures based on the results of this study. Midship Pipeline indicated that this study would be completed and submitted to FERC in the first quarter of 2018.

After construction and as required by the DOT regulations, the pipeline facilities would be marked at line-of-sight intervals and at crossings of roads, railroads, waterways, and other prominent points. The markers would indicate the presence of the pipeline and provide a telephone number where a company representative could be reached in the event of an emergency or before any third-party excavation in the area of the pipeline. Midship Pipeline would participate in the Oklahoma one-call program and other related pre-excavation notification programs.

Midship Pipeline would also comply with DOT regulations specific to compressor stations, which include but are not limited to:

- Each building on a compressor station site must be made of noncombustible material.
- Safe distances must be maintained between the compressor building and structures on adjacent properties.
- Adequate space must be maintained around the main compressor building to allow the free movement of fire-fighting equipment.
- Each compressor station building must be ventilated to ensure employees are not endangered by the accumulation of gas in enclosed spaces.

The DOT prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Each pipeline operator must establish an emergency plan that includes procedures to minimize the hazards in a natural gas pipeline

[23] Cathodic protection is a technique to reduce corrosion (rust) of the natural gas pipeline that includes the use of an induced current or a sacrificial anode (like zinc) that corrodes at faster rate to reduce corrosion.

emergency. In accordance with 49 CFR 192.615, key elements of Midship Pipeline's emergency procedures would include but are not limited to the following:

- receiving, identifying, and classifying emergency events such as gas leakage, other releases, fires, explosions, and natural disasters;
- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- making personnel, equipment, tools, and materials available at the scene of an emergency;
- protecting people first and then property from actual or potential hazards; and
- implementing emergency shutdown of the system and the safe restoration of service.

We received a comment expressing concern that local emergency services might not be sufficient to respond in the event of a project-related emergency. The DOT requires that each operator establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials. Midship Pipeline would provide the appropriate training to local emergency service personnel before the pipeline is placed into service.

Midship Pipeline would incorporate the project into gas monitoring and control systems, which would include a gas control center that would monitor system pressures, flows, and customer deliveries. The center would be staffed 24 hours a day, 7 days a week, and 365 days a year. If operating conditions fall outside predetermined ranges, alarms would be activated and Midship Pipeline's qualified Gas Controller would take appropriate action in response to the alarm condition.

The proposed pipeline system would be equipped with control valves that can be operated remotely by the gas control center. In the event of an emergency, usually evidenced by a sudden loss of pressure, the gas control center would send a command signal to initiate the closure of the remote control valves.

The proposed pipeline system would be operated in accordance with 49 CFR 192.615(a)(6) and would be equipped with a range of automatic emergency detection and shutdown systems, including hazardous gas and fire detection alarm systems. These safety and emergency systems would be monitored on a 24-hour basis by the gas monitoring and control system described above.

In accordance with DOT regulations, Midship Pipeline would regularly inspect the proposed facilities for leakage as part of scheduled operations and maintenance, including:

- conducting periodic field patrols;
- conducting aerial inspections of the right-of-way as required;
- inspecting valves and maintaining compressor engines; and
- conducting leak detection surveys as required by regulations.

During inspections, employees would look for signs of unusual activity on the right-of-way and would immediately respond to assess the nature of the activity and remedy with prescribed corrective action.

4.12.2 Pipeline Accident Data

The DOT requires all operators of natural gas transmission pipelines to notify the DOT of any significant incidents and to submit a written report within 30 days. Significant incidents are defined as any leaks that:

- cause a death or personal injury requiring hospitalization; or
- involve property damage of more than $50,000 in 1984 dollars.[24]

During the 20-year period from 1995 through 2014, a total of 1,265 significant incidents were reported on the more than 300,000 total miles of natural gas transmission pipelines nationwide.

Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. Table 4.12.2-1 provides a distribution of the causal factors, as well as the number of each incident by cause. The dominant causes of natural gas transmission pipeline incidents are corrosion and pipeline material, weld, or equipment failure, which constitute 49.6 percent of all significant incidents. The pipelines included in the data set for table 4.12.2-1 vary widely in terms of age, pipe diameter, and level of corrosion control. Each variable influences the incident frequency that may be expected for a specific segment of pipeline. The frequency of significant incidents is strongly dependent on pipeline age. Older pipelines have a higher frequency of corrosion incidents because corrosion is a time-dependent process.

TABLE 4.12.2-1

Natural Gas Transmission Pipeline Significant Incidents by Cause (1995 to 2014)

Cause	Number of Incidents	Percentage
Corrosion	291	23.0
Excavation [a]	207	16.4
Pipeline material, weld, or equipment failure	337	26.6
Natural force damage	147	11.6
Outside forces [b]	79	6.2
Incorrect operation	40	3.2
All other causes [b]	164	13.0
TOTAL	**1,265**	--

Source: PHMSA, 2017a

[a] Includes third-party damage.

[b] Fire, explosion, vehicle damage, previous damage, intentional damage.

[c] Miscellaneous causes or unknown causes.

Older pipelines also have a higher frequency of outside forces incidents partly because their location may be less well known and less well marked than newer lines. In addition, the older pipelines contain a disproportionate number of smaller diameter pipelines, which are more easily crushed or broken by mechanical equipment or earth movements.

Outside force, excavation, and natural forces were the cause in 34.2 percent of significant pipeline incidents from 1995 to 2014. These result from the encroachment of mechanical equipment such as

[24] $50,000 in 1984 dollars is approximately $118,585 in 2017 (Bureau of Labor Statistics, 2017).

bulldozers and backhoes; earth movements due to soil settlement, washouts, or geological hazards; and weather effects such as wind, storms, and thermal strains; and willful damage. Table 4.12.2-2 provides a breakdown of outside force, excavation, and natural force incidents by cause.

TABLE 4.12.2-2

Significant Incidents Resulting from Outside Forces, Excavation, and Natural Forces by Cause (1995 to 2014)

Cause	Number of Incidents	Percent of all Incidents
Third party excavation damage	172	13.6
Operator excavation damage	24	1.9
Unspecified excavation damage/previous damage	11	0.9
Heavy rain/floods	72	5.7
Earth movement	34	2.7
Lightning/temperature/high winds	26	2.1
Natural force (other)	15	1.2
Vehicle (not engaged with excavation)	47	3.7
Fire/explosion	8	0.6
Previous mechanical damage	6	0.5
Fishing or maritime activity	7	0.5
Intentional damage	1	0.1
Electrical arcing from other equipment/facility	1	0.1
Unspecified/other outside force	7	0.6
TOTAL	**431**	–

Source: PHMSA, 2017a

Since 1982, operators have been required to participate in "One Call" public utility programs in populated areas to minimize unauthorized excavation activities in the vicinity of pipelines. The One Call program is a service used by public utilities and some private sector companies (e.g., oil pipelines, cable television) to provide preconstruction information to contractors or other maintenance workers on the underground location of pipes, cables, and culverts.

4.12.3 Impact on Public Safety

The significant incident data summarized in table 4.12.2-1 include pipeline failures of all magnitudes with widely varying consequences. Table 4.12.3-1 presents the annual injuries and fatalities that occurred on natural gas transmission lines between 2010 and 2014.

The majority of fatalities from pipelines involve local distribution pipelines. These are natural gas pipelines that are not regulated by FERC and that distribute natural gas to homes and businesses after transportation through interstate natural gas transmission pipelines. In general, these distribution lines are smaller diameter pipes, often made of plastic or cast iron rather than welded steel, and tend to be older pipelines that are more susceptible to damage. In addition, distribution systems do not have large rights-of-way and the pipeline markers commonly associated with FERC-regulated natural gas transmission pipelines. Therefore, incident statistics inclusive of distribution pipelines are inappropriate to use when considering natural gas transmission projects.

TABLE 4.12.3-1

Annual Injuries and Fatalities – Natural Gas Transmission Pipelines (2010 to 2014)

Year	Injuries	Fatalities
2010 [a]	61	10
2011	1	0
2012	7	0
2013	2	0
2014	1	1

Source: PHMSA (PHMSA, 2017b).

[a] All of the fatalities in 2010 were due to the Pacific Gas and Electric pipeline rupture and fire in San Bruno, California on September 9, 2010.

The nationwide totals of accidental fatalities from various manmade and natural hazards are listed in table 4.12.3-2 in order to provide a relative measure of the industry-wide safety of natural gas transmission pipelines. Direct comparisons between accident categories should be made cautiously, however, because individual exposures to hazards are not uniform among all categories. Furthermore, the fatality rate for natural gas transmission pipelines is much lower than the fatalities from natural hazards (e.g., lightning, tornados, floods, earthquakes). Midship Pipeline would design, construct, operate, and maintain the proposed pipeline and aboveground facilities in accordance with or in exceedance of the DOT's Minimum Federal Safety Standards in 49 CFR 192. These regulations are intended to protect the public and to prevent natural gas facility accidents and failures. Furthermore, the available data show that natural gas transmission pipelines continue to be a safe, reliable means of energy transportation.

TABLE 4.12.3-2

Nationwide Accidental Deaths

Type of Accident	Annual Number of Deaths
All accidents	117,809
Motor vehicle [a]	45,343
Poisoning [a]	23,618
Falls [a]	19,656
Injury at work [a]	5,113
Drowning [a]	3,582
Fire, smoke inhalation, burns [a]	3,197
Floods [b]	81
Lightning [b]	49
Tornado [b]	72
Tractor turnover [c]	62
Natural gas distribution lines [d]	14
Natural gas transmission pipelines [d]	2

[a] Annual accidental deaths recorded in 2005 from the U.S. Census Bureau (2009).
[b] 30-year average (1985 to 2014) from National Weather Service (2017).
[c] 2007 census of fatal occupational injuries from the Bureau of Labor Statistics (2007).
[d] 20-year average (1995 to 2014) from PHMSA (PHMSA, 2017a).

4.12.4 Terrorism

Safety and security concerns have changed the way pipeline operators as well as regulators must consider terrorism, both in approving new projects and in operating existing facilities. The U.S. Department of Homeland Security, Office of Homeland Security is tasked with coordinating the efforts of all executive departments and agencies to detect, prepare for, prevent, protect against, respond to, and recover from terrorist attacks within the United States. Among its responsibilities, the Office of Homeland Security oversees the Homeland Infrastructure Threat and Risk Analysis Center, which analyzes and implements the National Critical Infrastructure Prioritization Program that identifies and lists Tier 1 and Tier 2 assets. The Tier 1 and Tier 2 lists are key components of infrastructure protection programs and are used to prioritize infrastructure protection, response, and recovery activities.

The Commission, in cooperation with other federal agencies, industry trade groups, and interstate natural gas companies, is working to improve pipeline security practices, strengthen communications within the industry, and extend public outreach in an ongoing effort to secure pipeline infrastructure. Unfortunately, we are unable to provide more details in this analysis. The Commission is faced with the dilemma of how much information can be offered to the public while still providing a significant level of protection for facilities and pipelines. Consequently, energy facility design plans and location information have been removed from its website to ensure that sensitive information filed under Critical Energy Infrastructure Information is not readily available (RM02-4-000 and PL02-1-000, issued February 20, 2003).

The likelihood of future acts of terrorism or sabotage occurring at the proposed facilities, or at any of the myriad of natural gas pipeline or energy facilities throughout the United States, is unpredictable given the disparate motives and abilities of terrorist groups. The continuing need to construct facilities to support the future natural gas pipeline infrastructure is not diminished from the threat of any such future acts.

4.13 CUMULATIVE IMPACTS

In accordance with NEPA, we considered the cumulative impacts of the MIDSHIP Project with other projects or actions within the geographic and temporal scope of the MIDSHIP Project. As defined by CEQ, a cumulative effect is the impact on the environment that results from the incremental effects of the proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such actions (CEQ, 1997b). Although the individual impact of each separate project may be minor, the additive effects of multiple projects could be significant. The potential direct and indirect impacts of the MIDSHIP Project on environmental resources are described in previous sections of this EIS.

The purpose of this analysis is to identify and describe cumulative impacts that would potentially result from construction and operation of the MIDSHIP Project. Inclusion of actions is based on identifying commonalities of impacts from other actions to the MIDSHIP Project's potential impacts on various environmental resources. To ensure that the analysis focuses on relevant projects and potentially significant impacts, this cumulative impacts analysis includes other actions meeting the following criteria:

- the action impacts a resource that would be affected by the MIDSHIP Project;
- the action causes impacts within all or part of the geographic scope of the MIDSHIP Project; and
- the action causes impacts within all or part of the temporal scope of the MIDSHIP Project.

The geographic scope for each resource is unique, and is generally more localized for somewhat stationary resources such as geological and soil resources; more expansive for resources with a large

geographic area, such as visual impacts and air emissions; and based on jurisdictional boundaries for resources such as socioeconomics and public lands. We evaluated cumulative impacts from a geographical perspective recognizing that the proximity of other actions to the MIDSHIP Project is a major predictor of where cumulative impacts would most likely result. In general, the closer another action is to the MIDSHIP Project, the greater the potential for cumulative impacts. Table 4.13-1 summarizes the resource-specific geographic boundaries considered in this analysis and the justification for each. Actions occurring outside these geographical boundaries were generally not evaluated because their potential to contribute to a cumulative impact diminishes with increasing distance from the MIDSHIP Project.

The temporal scope for each resource is also unique, and depends on the duration and permanency of the impacts associated with the resource. Past, present, and reasonably foreseeable projects and actions where the duration of time for construction, operation, and/or restoration overlaps with the timeframe for construction, operation, and restoration of the MIDSHIP Project were included in this analysis. Prior to the Civil War, much of the state of Oklahoma was occupied by more than 36 Indian tribes, and was referred to as the Indian Territories; following the Civil War, the Oklahoma landscape was dominated by ranching and cattle (Oklahoma Historical Society, 2018a, 2018b). However, since the completion of the first commercial oil well in 1897, the oil and gas industry have played a large role in the state's history (American Oil and Gas Historical Society, 2018; theus50.com; 2018). Past projects including roads, electric transmission lines, pipelines, agriculture, and commercial and residential development, have and continue to cumulatively affect the lands that would be crossed by the MIDSHIP Project.

Impacts from older projects (completed 5 or more years ago) are considered to have been mitigated over time, with the disturbed environment having become part of the baseline character of the region described in the affected environment for each resource. Therefore, projects completed 5 or more years ago are not considered ongoing contributors to cumulative impacts unless they have ongoing operational impacts (e.g., air emissions, discharges) with potential to contribute to a cumulative impact on air quality. Past projects that have been recently completed (within 5 years of the MIDSHIP Project) or that have ongoing operational impacts have been considered for their potential to contribute to a cumulative impact.

We have also considered how concurrent (present) and reasonably foreseeable future projects would contribute further to the cumulative impact of past projects (i.e., baseline conditions) and the MIDSHIP Project. Most of the impacts associated with the MIDSHIP Project would be short term and limited to the construction phase, which is currently estimated to take about a year, concluding in the summer of 2019. The potential for cumulative impacts associated with the MIDSHIP Project would be greatest during this period for most resources. The potential long-term cumulative impacts associated with the operation of the MIDSHIP Project and other actions (i.e., cumulative impacts extending well beyond the period of construction of the project) would include effects related to the clearing of forested lands and permanent land cover conversion along the permanent easement, the establishment of new or expanded rights-of-way, and noise and air emissions from aboveground facilities. For these resources, we expanded the temporal range of our cumulative impact analysis.

Both positive cumulative impacts (i.e., new jobs and tax revenues), and negative cumulative impacts (i.e., contribution to ongoing air emissions) were identified in the analysis. Where we determined that a potential for cumulative impacts exists, we quantified the impacts to the extent practicable. However, in some cases the potential impacts can only be described qualitatively. This is particularly the case for projects in the planning stages; contingent on economic conditions, availability of financing, and/or the issuance of permits; or for which there is a lack of available information.

TABLE 4.13-1

Resource-Specific Geographic Regions for Determining Cumulative Impacts for the MIDSHIP Project

Environmental Resource	Geographic Scope for Cumulative Impacts	Justification for Geographic Scope
Soils and Surficial Geology	Construction workspaces	Impacts on soils and surficial geology would be highly localized and would not be expected to extend beyond the area of direct disturbance associated with the project.
Groundwater, Surface Water, and Wetlands	HUC-12 sub-watershed	Impacts on groundwater and surface water resources could reasonably extend throughout a HUC-12 sub-watershed (i.e., a detailed hydrologic unit that can accept surface water directly from upstream drainage areas, and indirectly from associated surface areas such as remnant, noncontributing, and diversions to form a drainage area with single or multiple outlet points [NRCS, 2007]), as could the related impacts on aquatic resources and fisheries.
Vegetation and Wildlife	HUC-12 sub-watershed	Consideration of impacts within a HUC-12 sub-watershed sufficiently accounts for impacts on vegetation and wildlife that would be directly affected by construction activities and for indirect impacts such as changes in habitat availability and displacement of transient species.
Cultural Resources	Overlapping impacts within the APE	The APE for direct effects (physical) includes areas subject to ground disturbance, while the APE for indirect effects (visual or audible) includes aboveground ancillary facilities or other project elements that are visible from historic properties in which the setting contributes to their NRHP eligibility.
Socioeconomics	Affected counties	Affected counties would experience the greatest impacts associated with employment, housing, public services, transportation, traffic, property values, economy and taxes, and environmental justice.
Land Use	1.0-mile radius	Impacts on general land uses would be restricted to the construction workspaces and the immediate surrounding vicinity; therefore, the geographic scope for land use and recreation is 1.0 mile from the centerlines of the MIDSHIP Project pipelines and aboveground facility sites.
Visual	For aboveground facilities, the distance that the tallest feature at the planned facility would be visible from neighboring communities; for pipelines, a distance of 0.25 mile and existing visual access points (e.g., road crossings)	Assessing the impact based on the viewshed allows for the impact to be considered with any other feature that could have an effect on visual resources.
Noise – Operations	NSAs within 1 mile of a noise-emitting permanent aboveground facility	Noise from the MIDSHIP Project's permanent facilities is not anticipated to have an impact beyond 1.0 mile.
Noise – Construction	0.25 mile from pipeline or aboveground facilities construction activities; NSAs within 0.5 mile of an HDD or direct pipe installation	Areas in the immediate proximity of pipeline or aboveground facility construction activities (within 0.25 mile) would have the potential to be affected by construction noise. NSAs within 0.5 mile of an HDD or direct pipe installation could be cumulatively affected if other projects had a concurrent impact on the NSA.
Air Quality – Operations	50 kilometers from compressor stations and booster station (about 31.1 miles)	Impacts on air quality beyond 50 kilometers (31.1 miles) would be *de minimis*.
Air Quality – Construction	0.25 mile from pipeline or aboveground facility	Air emissions during construction would be limited to vehicle and construction equipment emissions and dust, and would be localized to the project construction sites.

Appendix L identifies the past, present, and reasonably foreseeable future projects and actions with the potential to contribute to a cumulative effect with the MIDSHIP Project. Projects and actions were identified by reviewing a variety of publically available information, including but not limited to pending or approved permit information from federal, state, and local agencies; various organization's websites; commercial company websites; news outlets; and desktop and field review. We then applied the criteria described above to identify which projects and actions may affect resources within the same temporal and geographic scope as the MIDSHIP Project. The anticipated cumulative impacts of the MIDSHIP Project and other projects or actions are described below, including any pertinent mitigation actions.

We received a comment from the Sierra Club on April 20, 2017 suggesting that Midship Pipeline's addition of the Velma Lateral and Sholem Booster Station after filing its preliminary draft Resource Reports 1 and 10 in December 2016 constitutes project segmentation. We disagree. CEQ regulations require the Commission to include "connected actions," "cumulative actions," and "similar actions" in its NEPA analyses. An agency impermissibly 'segments' NEPA review when it divides connected, cumulative, or similar federal actions into separate projects and thereby fails to address the true scope and impact of the activities that should be under consideration. A project at the pre-filing stage is not a proposal, but is in its early stages of development and the NEPA process. The purpose of pre-filing is to involve interested stakeholders early in project planning and to identify and resolve issues before an application is filed. In addition, an applicant is able to add, delete, or modify project components in response to stakeholder issues or purpose and need. Considering that Midship Pipeline added the Velma Lateral and Sholem Booster Station to the MIDSHIP Project during the pre-filing process and the facilities are included in our analysis, this action does not represent segmentation.

4.13.1 Projects and Activities Considered

4.13.1.1 FERC-Jurisdictional Natural Gas Pipeline Projects

In addition to the MIDSHIP Project, three other FERC-jurisdictional pipeline projects are currently proposed in Oklahoma (the 2018 Line V Replacement Project, Blue Mountain Delivery Line Project, and Blue Mountain Chisholm Trail Project). The 2018 Line V Replacement Project, proposed by Southern Star Central Gas Pipeline, Inc., was filed with FERC in April 2018 (Docket No. CP18-384). The 2018 Line V Replacement Project consists of replacing seven non-contiguous segments of 20- and 24-inch-diameter pipeline, totaling about 14.4 miles, in Oklahoma and Logan Counties. No aboveground facilities are proposed as part of the 2018 Line V Replacement Project. The nearest replacement segment is over 19 miles east of proposed milepost CH0.0 on the Chisholm Lateral. Because none of these facilities would fall within the geographic scope of our analysis, the 2018 Line V Replacement Project is not discussed further. The Blue Mountain Delivery Line Project, proposed by Blue Mountain Midstream, LLC, and the Blue Mountain Chisholm Trail Project, proposed by Southern Star Central Gas Pipeline, Inc., were filed with FERC in 2017 (Docket No. CP18-14-000 and CP18-17-000, respectively). Both projects are designed to transport gas to or from the Chisholm Trail Cryogenic Gas Plant, currently under construction in Grady County (anticipated completion May 2018), about 3.6 miles northeast of Mainline MP 39.0. The Blue Mountain Delivery Line Project would involve construction and operation of two segments of natural gas pipelines (4.4 miles of 20-inch-diameter pipeline and 5.2 miles of 12-inch-diameter pipeline) as well as a metering and pigging facility in Grady County, Oklahoma. The Blue Mountain Delivery Line Project intersects the proposed Mainline near MP 42.9. The Blue Mountain Chisholm Trail Project would involve construction and operation of about 4.7 miles of 12-inch-diameter pipeline and metering facility in Grady County, and installation of a skid-mounted compressor station (totaling about 4,145 horsepower) in Carter County. None of the Blue Mountain Chisholm Trail Project facilities are crossed by the MIDSHIP Project; however the metering facility is about 2 miles northeast of Mainline MP 43.0, and the compressor station is about 3 miles southwest of Mainline MP 103.0. Construction of the Blue Mountain Delivery Line Project

and the Blue Mountain Chisholm Trail Project is expected to begin in January 2018 and conclude by May 2018. Impacts from the Blue Mountain Delivery Line Project and the Blue Mountain Chisholm Trail Project would be similar to those expected from the MIDSHIP Project, but on a smaller scale because of the smaller diameter and shorter length of the pipe, and the smaller size of the required aboveground appurtenances. Similar to the MIDSHIP Project, the Blue Mountain Delivery Line Project and the Blue Mountain Chisholm Trail Project would be required to be constructed in accordance with the FERC Certificate, as well as other federal, state, and local regulations. Any impacts from operation of the projects would be minimal.

One other FERC-jurisdictional pipeline project in Oklahoma, the Sooner Trails Pipeline planned by Sooner Trails Pipeline, LLC (Sooner Trails), entered FERC's pre-filing process in 2015 (Docket No. PF15-30-000). However, Sooner Trails withdrew the project from FERC's pre-filing process on April 21, 2017 after a binding open season yielded insufficient market support. Any FERC-jurisdictional projects constructed more than 5 years ago have likely been mitigated over time and are considered to be part of the background environmental conditions. FERC-jurisdictional projects would have been constructed and maintained in accordance with the FERC Plan and Procedures and other construction, operation, and mitigation measures required by federal, state, or local permitting authorities.

4.13.1.2 Non-Jurisdictional Project-Related Actions

As described in section 1.4, the only non-jurisdictional facilities associated with the proposed MIDSHIP Project are electric powerlines necessary to supply power to the aboveground facilities. Construction and operation of these facilities would be under the jurisdiction of the OCC, which is responsible for licensing and regulating electric power utilities in Oklahoma, and ODEQ, which is the jurisdictional agency for state environmental permitting. Resource impacts from the non-jurisdictional powerlines and would be similar to the impacts of the MIDSHIP Project, but on a smaller scale, due to the reduced ground disturbance needed to construct powerlines. Midship Pipeline is anticipating that a 50-foot-wide construction and operation right-of-way would be required.

4.13.1.3 Oil and Natural Gas Production

The proposed project facilities are primarily within the SCOOP and STACK plays, which extend through western Oklahoma and the northeast corner of the Texas panhandle. The SCOOP and STACK plays have attractive production economics that are heavily dependent on crude oil production. However, during oil production activities, natural gas and natural gas liquids byproducts are also produced that must be processed and transported by pipeline (RBN Energy, LLC, 2017). Because the composition of the shale layer targeted for extraction is mixed, and because it is impossible to drill for any one resource in particular, the analysis of natural gas production cannot be separated from oil production in the region.

Midship Pipeline identified 587 active oil and/or gas wells within 0.25 mile of the MIDSHIP Project. To estimate future oil and gas drilling and production activities in the vicinity of the MIDSHIP Project and to identify where production is most prevalent, we expanded the search to evaluate all permitted wells in the counties crossed by the MIDSHIP Project using the OCC's Well Data System database (OCC, 2017a). Table 4.13.1-1 provides the number and status of oil and gas wells by county. For the counties crossed by the MIDSHIP Project, the number of active wells ranges from 146 in Johnston County to 14,073 in Stephens County. The highest density of wells occurs in Stephens County, which averages about 27 wells per square mile. Wells are most dispersed in Johnston and Bryan Counties, which each average less than 1 well per square mile.

TABLE 4.13.1-1

Number and Status of Oil and Gas Wells Within Counties Crossed by the MIDSHIP Project

Status	Kingfisher County	Canadian County	Grady County	Garvin County	Stephens County	Carter County	Johnston County	Bryan County
Active Wells	4,808	4,375	5,829	6,482	14,073	14,067	146	170
Expired	39	54	70	78	97	144	13	10
New drill	8	14	5	5	11	3	0	0
Plugged and abandoned	4,054	2,321	2,475	6,783	8,763	6,556	175	331
Spudded	44	21	22	39	58	71	3	0
Temporarily abandoned [a]	3	26	22	176	498	365	1	7
Terminated [b]	131	1	101	236	615	677	0	2
Unknown [c]	671	267	342	207	119	197	19	2
TOTAL WELLS	**9,558**	**7,109**	**8,866**	**14,006**	**24,234**	**22,080**	**357**	**522**
County Area (mi^2)	906	906	1,105	814	891	834	658	944
Avg. wells per mi^2	11	8	8	17	27	26	1	1

[a] Well bore temporarily abandoned; but is a candidate for future utilization.
[b] Well is no longer producing.
[c] Well was included in the query results but did not have an identified status.

The oil and gas companies with assets in the vicinity of the MIDSHIP Project and other companies who have applied for permits to drill new wells could reasonably be expected to conduct exploration, drilling, and production activities during the construction, restoration, and/or operation of the MIDSHIP Project. However, the timing and specific location of these activities are unknown.

After wells are drilled and begin extracting oil, natural gas, and natural gas liquids, gathering lines would also be required to transport the product extracted from the well to a processing facility and eventually to a larger transmission line to reach market. Generally, impacts related to new wells would include temporary, construction-related impacts and permanent ground disturbance at the well pad sites and along the access roads to these facilities. Impacts from construction and operation of natural gas gathering lines would be similar to those expected from natural gas transmission lines, but on a smaller scale because of the smaller diameter and shorter length of the pipe, and the smaller size of the required aboveground appurtenances.

Cumulative effects have a greater probability of occurring in counties where oil and gas production is prevalent, specifically in Stephens, Carter, Kingfisher, Grady, and Canadian Counties. Construction impacts from the development of new wells would likely include construction noise and air emissions, increased ground disturbance during development, and a continued effect on the visual landscape. There is also a potential for ongoing oil and gas drilling activities to increase seismic risk in the vicinity of the MIDSHIP Project (see section 4.1.4.1).

4.13.1.4 Oil and Natural Gas Transport, Processing, and Storage

Transport

Plains All American Pipeline, LP's Duncan-Longview Project is a 16-inch-diameter, 226-mile-long crude oil pipeline that was completed in 2016. Based on a press release from Plains All American

Pipeline, LP in November 2014, the Duncan-Longview Project originates from the Plains Basin pipeline system at Duncan, Oklahoma and largely follows an existing Plains American Pipeline right-of-way to Longview, Texas. Based on a review of Rextag (2017) data, it appears that the existing Plains American Pipeline, LP right-of-way runs parallel to the MIDSHIP Project about 15 miles southwest of MP 110, but is unlikely to cross the proposed pipeline routes. To be conservative, we evaluated impacts as if construction occurred within 1.0 mile of the MIDSHIP Project. We anticipate that any potential impacts within the construction footprint would be minimal because the right-of-way has had some time to become reestablished. Similar to the MIDSHIP Project, the Duncan-Longview Project would have been required to be constructed in accordance with federal, state, and local regulations. Any ongoing impacts from the project would be minimal.

Midship Pipeline also identified active construction of a Plains All American Pipeline, LP pipeline intersecting the proposed Chisholm Lateral at CH0.2 during 2016. We anticipate that any potential impacts within the construction footprint would be minimal because the right-of-way has had some time to become reestablished. Similar to the MIDSHIP Project, this Plains All American Pipeline, LP project would have been required to be constructed in accordance with federal, state, and local regulations. Any ongoing impacts from the project would be minimal.

Enable Midstream Partners is currently constructing the Cana & STACK Expansion (CaSE) Project, which is designed to utilize existing and expansion facilities, as well as capacity on third-party pipelines, to provide 400,000 dekatherms of new takeaway capacity from the Cana, STACK, and SCOOP plays. Due to the use of existing or expanded existing facilities, ground disturbance is likely to be minimal, but construction- and operation-related air, noise, and socioeconomic impacts could occur.

Additionally, 292 existing natural gas compressor or booster stations were identified within 50 kilometers of the proposed MIDSHIP Project compressor stations. These compressor and booster stations are contributing to an ongoing negative impact on air quality in the vicinity of the MIDSHIP Project; however, modeling of air emissions for the MIDSHIP Project includes existing air quality (baseline conditions).

Processing and Storage

A total of 28 oil and gas processing plants, terminals, and/or refineries, which may cumulatively impact air quality, were identified within 50 kilometers from a MIDSHIP Project compressor or booster station. While all of these prior actions are contributing to an ongoing impact on air quality, facilities in close proximity to the MIDSHIP Project have a greater potential to have a cumulative effect during operation, especially on noise, air, and visual resources. Cumulative impacts from these facilities are discussed in more detail in later sections. These facilities include:

- Blue Mountain Midstream, LLC's Chisholm Trail Cryogenic Gas Plant, about 3.6 miles northeast of Mainline MP 39.0;
- DPC Midstream, LP's Sholem Gas Plant, about 0.2 mile north of the Sholem Booster Station;
- Enable Products, LLC's South Canadian Processing Plant, about 0.2 mile north of the Calumet Compressor Station;
- DPC Midstream, LP's Okarche Plant, less than 0.2 mile north of the Okarche and MarkWest Meter Stations; and

- Cimerex Visio-Cana 5 Tank Battery temporary crude oil storage and measuring device, less than 0.1 mile west of Mainline MP 9.6.

4.13.1.5 Electric Generation and Transmission Projects

In addition to the new, non-jurisdictional powerlines described in section 4.13.1.2, several electric generation and transmission projects were identified during the cumulative impacts analysis, including:

- The Plains and Eastern Clean Line Project is a planned 700-mile-long direct current transmission line that would parallel the MIDSHIP Project about 20 miles north of the Chisholm Lateral. Construction of the project is estimated to start in early 2018.
- The Darlington Road – Roman Nose Project is a new 138 kilovolt transmission line that is collocated with the mainline between MPs 9.9 to 10.4 in Canadian County. Construction of the project was completed in June 2017.
- The Stonewall – Wapanucka 138 kilovolt Project is a new 6.4-mile-long electric transmission line about 14.0 miles northeast of the MIDSHIP Project Mainline at MP 162.5. Construction of this project was completed in June 2015.
- The Kingfisher Wind Project is an 11,000-acre wind farm comprising 149 turbines distributed throughout 30 sections[25] (areas) in Kingfisher and Canadian Counties, averaging about 5 wind turbines per square mile. The Kingfisher Wind Project has wind turbines clustered in Kingfisher County on the northern side of the Kingfisher/Canadian County line. The Chisolm Lateral intersects this part of the wind farm from MP CH0.0 to CH6.2 with turbines occurring both north and south of the pipeline lateral route. The wind farm has a second cluster of wind turbines in Canadian County south of the Kingfisher/Canadian County line, about 3.0 miles south of the Chisolm Lateral between MPs CH6.2 to CH11.4.

Ground-disturbing activities resulting from construction and operation of these electric transmission and generation projects are likely similar to those expected for the MIDSHIP Project. Aboveground towers and wind turbines would have a greater impact on the viewshed during project operation compared to the buried pipeline and dispersed aboveground facilities proposed for the MIDSHIP Project. The Darlington Road – Roman Nose Project could result in some overlapping impacts within the project footprint where the projects intersect; however, the completed Darlington Road – Roman Nose Project has had some time for vegetation to become reestablished. The projects are collocated in a landscape dominated by agricultural lands, and may contribute to a cumulative impact on a nearby ephemeral steam (unnamed tributary to Six Mile Creek) crossed by the MIDSHIP Project Mainline at MP 9.5. Prompt restoration of both projects to minimize the potential for erosion and sedimentation would minimize the overlapping impact on this waterbody. The combined impacts from the projects at this location are not anticipated to contribute to an ongoing cumulative impact on any resources.

4.13.1.6 Transportation and Commercial/Residential Development Projects

No past, presently occurring, or planned residential development projects were identified within the geographic scope of the MIDSHIP Project. Commercial Metals Company Steel Mill Project is a

[25] The Public Land Survey System was developed to subdivide and describe public domain lands in the United States. This system is still used for legal land descriptions for private lands that were once part of the public domain. The Public Land Survey System typically divides land into 6.0-mile-square townships, which are subdivided into 36 1.0-square-mile sections. A section is nominally a 1.0-square-mile block of land (USGS, 2017e).

commercial development project currently under construction about 9.0 miles south of MP 179.0 in Bryan County, and was completed in December 2017. This project includes extensive waterbody impacts associated with permanently filling and rerouting a stream around the 390.0-acre project site. Impacts on waterbodies and wetlands affected by both the steel mill development project and the MIDSHIP Project are further discussed in section 4.13.2.2.

Several transportation projects overseen by the Oklahoma Turnpike Authority and the Oklahoma Department of Transportation (ODOT) are also proposed in the vicinity of the MIDSHIP Project. Midship Pipeline identified two of these projects within the geographic scope of the MIDSHIP Project:

- Oklahoma Turnpike Authority's Kilpatrick Extension Project is a planned 7.0-mile-long highway extension near Oklahoma City, Oklahoma. Construction has not yet been scheduled.

- ODOT's State Highway 53 Road Improvements Project is a 5.6-mile-long highway improvement project that will begin utility relocation in 2018 and has highway construction activities scheduled to begin in 2020. The project begins about 0.2 mile north of Mainline MP 119, and extends eastward, roughly paralleling, but not collocated with, the MIDSHIP Project until about MP 124.5.

Construction of the steel mill should be complete by the time construction of the MIDSHIP Project would begin, but construction of the ODOT project could coincide with construction of the MIDSHIP Project. The State Highway 53 Road Improvements Project is within the same HUC-12 watershed as the project and could contribute to the cumulative impacts of the MIDSHIP Project on surface waters, wetlands, vegetation, wildlife, socioeconomics, land use, the viewshed, and air quality and noise during construction within this 5.6-mile-long area. The majority of impacts from the road construction projects would be temporary, highly localized, and generally confined to previously disturbed areas; therefore, the potential contribution of these actions to the cumulative impacts associated with the MIDSHIP Project would be minor.

4.13.2 Potential Cumulative Resource Impacts of the Proposed Action

The potential resource-specific impacts that we considered as part of our cumulative impacts review include:

- geology and soils;
- water resources (groundwater, surface water, and wetlands);
- vegetation;
- wildlife;
- fisheries and other aquatic resources;
- special status species;
- land use, recreation, special interest areas, public lands, and visual resources;
- socioeconomics;
- cultural resources;
- air quality and noise; and
- climate change.

In the following analysis, we describe the potential cumulative impacts associated with the MIDSHIP Project in conjunction with the general development of the projects identified above. Additional

details regarding these projects are presented in appendix L. As described in section 4.13.1, we did not consider more distant actions in our analysis.

4.13.2.1 Geology and Soils

Soils and Surficial Geology

Impacts on soils and surficial geology during construction of the MIDSHIP Project would occur during blasting, clearing, grading, trench excavation, backfilling, and the movement of construction equipment along the right-of-way. These activities could increase the potential for soil erosion and sedimentation, and/or contribute to compaction of soils, and are not anticipated to extend beyond the area of direct disturbance. Some permanent construction impacts on soils and surficial geology would occur at the aboveground facilities; however, there is no potential for cumulative impacts within site boundaries because these impacts are spread out across the project and the facilities would only be used for project-related activities.

Midship Pipeline would implement mitigation measures to minimize impacts on soils and surficial geology; therefore, the temporal scope for cumulative impacts on geology and soils would extend from the moment soils are exposed during grading until stabilization (generally through revegetation) has been achieved. Other projects to be considered would need to have overlapping impacts within or immediately adjacent to construction workspaces and have soils that have not achieved stabilization. We anticipate that these projects would have to occur (or be planned to occur) within 3 years of the start of construction.

Construction of the Blue Mountain Delivery Line Project is scheduled to occur between January and May 2018. Because the Blue Mountain Delivery Line Project footprint overlaps with the proposed Mainline, and the timing of construction would be similar, we anticipate that the projects would have a temporary and minor cumulative impact on soils at the crossing location (near Mainline MP 42.9). As a result, there would be potential for increased erosion and sedimentation until this area is fully stabilized.

Construction of the Darlington Road – Roman Nose electric transmission project was completed in May 2017. The non-jurisdictional electric powerlines would be constructed concurrently with the MIDSHIP Project so that they are operational prior to the in-service date. Electric transmission line construction impacts on soils and surficial geology are generally less than those associated with pipelines because the soil disturbance is concentrated to the areas at the base of the towers and the travel lanes between the towers are narrower; however, increased erosion and sedimentation continue until the disturbed sites are fully stabilized.

During a 2016 site visit, Midship Pipeline observed construction activities associated with a Plains All American Pipeline, LP pipeline intersecting the proposed Chisholm Lateral workspace at MP CH0.2. Because restoration of the right-of-way associated with this pipeline occurred about 1.5 years ago, sufficient time has passed that the right-of-way should be sufficiently revegetated and the soil stabilized.

Because these projects have relatively small footprints and/or have had time to stabilize through revegetation, we conclude cumulative effects on soils and surficial geology would be minor.

4.13.2.2 Water Resources

The MIDSHIP Project has the potential to contribute to a cumulative impact on groundwater, surface water, and wetland resources in conjunction with other projects that are within the temporal and geographic scope of the cumulative impact analysis. Projects or actions that occur within the same HUC-12 subwatershed as the MIDSHIP Project, and those that occurred within the past 5 years, are planned to be

concurrent, or are reasonably foreseeable were considered in this analysis. The projects that meet the criteria and have the potential to contribute to a cumulative effect on groundwater, surface water, and wetland resources are:

- Blue Mountain Delivery Line Project;
- Blue Mountain Chisholm Trail Project;
- non-jurisdictional electric powerlines;
- Chisholm Trail Cryogenic Gas Plant;
- oil and gas production activities;
- existing compressor stations and booster stations;
- Visio-Cana Tank Battery;
- Darlington Road – Roman Nose Project;
- Kingfisher Wind Project;
- State Highway 53 Road Improvements Project; and
- Commercial Metals Company Steel Mill Project.

Construction of several of these projects, including the compressor and booster stations, Darlington Road – Roman Nose Project, Kingfisher Wind Project, and the Commercial Metals Company Steel Mill Project, are complete or will be completed prior to the start of construction of the MIDSHIP Project. The rest of the projects and actions are anticipated to occur concurrently with the MIDSHIP Project or into the future.

Groundwater

Midship Pipeline would minimize groundwater impacts through the use of both the standard and specialized construction techniques in its SPRP, the Plan and Procedures, and the project-specific *Blasting Plan*. If a water supply well or spring is damaged as a result of project construction, the well would be repaired/replaced or the well owner would be compensated for damages. To reduce the potential impacts on groundwater during construction of the MIDSHIP Project, Midship Pipeline would install erosion and sediment controls; restore natural ground contours; adhere to federal, state, and local regulations during blasting activities; and revegetate the rights-of-way. In addition, no groundwater withdrawals or injections are proposed for the MIDSHIP Project. Therefore, impacts on groundwater resources would be minor and temporary. The other projects that could contribute to cumulative impacts on groundwater would likely be required to obtain water use and discharge permits, implement erosion and sediment controls, and adhere to various spill plans as mandated by federal and state agencies. Therefore, we conclude that no long-term cumulative impacts on groundwater resources would occur.

Surface Waters

Construction and operation of the MIDSHIP Project would primarily result in short-term impacts on surface water resources. Construction impacts on surface waters would include increases in sediment loads, especially during in-stream activities such as trenching and backfilling. Longer term impacts, including increased water temperature, could occur as a result of reduced riparian vegetation on streambanks. The level of impact would depend on precipitation events, sediment loads, stream area/velocity, channel integrity, bed material, and proposed construction and restoration methods. Midship Pipeline would stabilize streambanks within 24 hours of completing in-stream construction activities and maintain temporary erosion and sediment control measures throughout construction until streambanks are stabilized. No long-term effects on surface waters associated with operation and maintenance of the pipelines are anticipated.

As described above, there are several projects within the geographic scope of the MIDSHIP Project that would likely occur within the same temporal scope, and a cumulative impact on surface waters could occur from one or more of those projects and actions. The Blue Mountain Delivery Line Project, the Blue Mountain Chisholm Trail Project, and the MIDSHIP Project would be constructed within both spatial and temporal proximity; however, waterbody crossings associated with the two projects are not in close proximity. Based on aerial photography, it does not appear that any non-jurisdictional powerlines would span the same waterbodies as the MIDSHIP Project. Should a minor or intermediate waterbody crossing be required, in-stream activities would likely be avoided, but increased sedimentation could temporarily occur during vegetation clearing. Because the locations of planned oil and gas drilling activities and existing compressor/booster stations are unknown, we cannot determine if there would be a cumulative impact on any particular waterbodies crossed by the MIDSHIP Project. However, we can anticipate that the Blue Mountain Delivery Line Project, the Blue Mountain Chisholm Trail Project, non-jurisdictional powerlines, and planned oil and gas drilling activities would contribute to a cumulative impact on surface waters within the shared HUC-12 subwatersheds as a result of in-stream work or ground-disturbing construction activities if constructed during a similar timeframe.

Construction of the Visio-Cana Tank Battery and the Darlington Road – Roman Nose Project will both occur in the immediate vicinity (within 0.1 mile) of an ephemeral steam (unnamed tributary to Six Mile Creek) that would be crossed by the MIDSHIP Project. Midship Pipeline would cross this stream at Mainline MP 9.5 via the wet open-cut crossing method. In-stream impacts would likely be avoided by both of the other projects, but increased sedimentation and other impacts on this waterbody could occur as a result of the activities. The MIDSHIP Project is most likely to contribute to a cumulative impact on surface waters, including the unnamed tributary to Six Mile Creek, where development activities occur along a single waterbody.

The MIDSHIP Project has the potential to contribute to a cumulative impact on nearby surface waters that were also potentially affected by the Kingfisher Wind Project, including tributaries to Campbell Creek, Clear Creek and its tributaries, and Uncle Johns Creek and its tributaries. However, construction of the Kingfisher Wind Project was completed in 2016 and, if restoration of disturbed areas is complete, their contribution to sediment loading of nearby waterbodies would be minimal and/or greatly reduced.

The State Highway 53 Road Improvements Project is just north of the MIDSHIP Project at Mainline MPs 119.0 and 124.5. Construction is scheduled to begin in 2020, with some preliminary right-of-way and utility relocation work scheduled to occur concurrently with construction of the MIDSHIP Project. Although it is an existing highway, there will be a widened corridor constructed across one perennial and two intermittent waterbodies that would also be crossed by the MIDSHIP Project about 0.7 mile (Henry House Creek and Grindstone Creek) to 2.0 miles (Phillips Creek) downstream. Midship Pipeline would avoid impacts on Henry House Creek by using the HDD crossing method at this location; however, temporary in-stream impacts would occur at the other stream crossings. Because the MIDSHIP Project stream crossings would be complete prior to the start of the majority of the construction activities associated with the highway project, any ongoing or cumulative impacts would be minimal.

The Commercial Metals Company Steel Mill Project is about 8.8 miles south of the MIDSHIP Project at Mainline MP 179.0. The steel mill project involves placing permanent fill into the unnamed tributary to Kanola Creek and rerouting the stream by constructing a new stream channel around the perimeter of the 390.0-acre site. The project includes about 3,495 linear feet of stream impacts. This project, which obtained a permit from the Tulsa District of the USACE (SWT-2015-293), will be required to adhere to the terms and conditions of its section 404 permit including mitigation (compensatory or otherwise) of permanent stream impacts. The MIDSHIP Project would not cross Kanola Creek or any of its tributaries, and no similar permanent fill or permanent diversion of waterbodies are planned. Therefore, we conclude that cumulative impacts, if any, would be minimal.

Impacts on surface waters would be temporary and mostly associated with construction activities, ceasing upon settlement of turbid waters and successful stream bank revegetation. There has been ample time for restoration and revegetation at nearby project sites where construction has already occurred, so cumulative impacts on surface waters would only occur if another project occurs simultaneously and within the same geographic scope as the MIDSHIP Project. Therefore, we conclude that the projects would not cause significant additive or cumulative impacts on surface waters.

Wetlands

Impacts on wetlands resulting from construction of the MIDSHIP Project would include moderate, temporary effects during construction and minor, long-term effects during operation; however, these impacts would be appropriately mitigated and reduced to less than significant levels (see discussion in section 4.4.4). During operation, portions of PSS and PFO wetlands within the permanent right-of-way would be permanently converted to PEM wetlands or PSS wetlands, respectively, to maintain up to a 10-foot-wide herbaceous corridor and to selectively cut trees growing within 15 feet of the pipeline. While the conversion from one vegetation cover type to another would result in changes in wetland functions and values, the converted wetlands would continue to provide important ecological functions once they have regenerated after construction. No wetland fill is proposed as part of the MIDSHIP Project.

As with surface water impacts, the greatest opportunity for the MIDSHIP Project to contribute to a cumulative impact on wetlands is where the same wetland would be affected by both the MIDSHIP Project and another project/activity. The Blue Mountain Delivery Line Project, Blue Mountain Chisholm Trail Project, and Kingfisher Wind Project overlap several HUC-12 subwatersheds crossed by the MIDSHIP Project but would not affect any of the same wetlands. All of the projects listed above would have the opportunity to contribute to a cumulative impact on wetlands within the subwatersheds crossed by the MIDSHIP Project, but no projects were identified that would contribute to an additive impact on any singular wetland crossed. Additionally, Midship Pipeline would be required to adhere to the terms and conditions of its 404 permit, including any compensatory mitigation for unavoidable wetland impacts. Therefore, we conclude that the projects identified in the cumulative impact analysis in association with the MIDSHIP Project would not cause significant additive or cumulative impacts on wetlands.

4.13.2.3 Vegetation and Wildlife

Construction activities associated with the MIDSHIP Project would result in temporary and permanent impacts on vegetation, and temporary impacts on wildlife. Right-of-way clearing, grading, and other construction activities would directly result in the removal of vegetation, alteration of wildlife habitat, and the temporary displacement of wildlife and would cause secondary effects such as increased population stress, predation, and the establishment of invasive plant species. As detailed in section 4.5.1.1, the majority of the MIDSHIP Project workspace consists of open upland and forested upland. The effect of clearing would be greatest during and immediately following construction, and would diminish when the disturbed areas are restored and displaced wildlife returns. Open lands and smaller woody vegetation would be expected to recover within a few growing seasons, and mature forested areas would take considerably longer, up to 20 to 50 years.

Construction impacts would primarily be localized, but operation and maintenance activities would result in permanent changes to vegetation communities that would have a broader impact on the landscape and surrounding ecosystems. Several of the other projects listed in section 4.13.2.2 have already been completed; and if the rights-of-way and site facilities have been restored and revegetated, cumulative impacts from these construction activities would be minimal except where forested lands are cleared for construction and operation of the projects. Concurrent projects, including the Blue Mountain Delivery Line Project, Blue Mountain Chisholm Trail Project, non-jurisdictional powerlines, Chisholm Trail Cryogenic Gas Plant, oil and gas drilling and storage facilities, and the highway project, are expected to contribute to

a cumulative impact on vegetation and wildlife within subwatersheds shared with the MIDSHIP Project. Cumulative impacts could be mitigated by prompt restoration of disturbed areas, siting the projects to avoid sensitive resources, and designing the projects to minimize the potential for long-term resource losses. Future oil and gas drilling activities would contribute to ongoing vegetation clearing and wildlife disturbance in the counties most likely to experience production growth, including Stephens, Carter, Kingfisher, Grady, and Canadian Counties.

Although the MIDSHIP Project would contribute to cumulative impacts on vegetation (primarily forested lands), the amount of collocation with existing rights-of-way, and eventual regrowth of previously forested areas outside the permanent right-of-way would reduce the impact to less than significant levels. The MIDSHIP Project's cumulative impact on vegetation would be moderate in forested areas and minor elsewhere. Similarly, construction and operation of the MIDSHIP Project would not significantly affect wildlife based on the availability of suitable adjacent habitat, collocation of the pipeline with existing rights-of-way (limiting the creation of new edge habitat), and the relatively low amount of habitat converted to developed land. Therefore, we conclude that moderate cumulative impacts on forested land and minor cumulative impacts on the wildlife that inhabits this forested land could occur.

4.13.2.4 Fisheries and Other Aquatic Resources

Potential impacts on warm water and cool water fishery resources as a result of the MIDSHIP Project include habitat alteration, increased sedimentation and turbidity, stream bank erosion, introduction of foreign objects, temperature change, removal of riparian vegetation, and the potential for spills and releases of hazardous materials into waterways. Fisheries of special concern include the Canadian River, Pennington Creek, and the Blue River. All of these fisheries of special concern would be crossed via the HDD method. Impacts on these and other fisheries would be minimized through use of the HDD method, adherence to measures outlined in the Plan and Procedures, and implementation of Midship Pipeline's project-specific HDD Plan and SPRP.

Construction of the electrical transmission lines, wind project, and oil and gas production, storage, and processing facilities would have less potential to affect fisheries because they would not require in-stream disturbance, but could have introduced sediment into waterbodies if erosion and sediment controls were not implemented. The State Highway 53 Road Improvements Project may involve some in-stream work, but any impacts on fisheries would be minor and primarily limited to the construction phase of the project (which is not scheduled until 2020). Similarly, construction of the Blue Mountain Delivery Line Project and Blue Mountain Chisholm Trail Project may include concurrent in-stream activities within the same subwatershed; however, no sensitive fisheries would be affected by these projects, and waterbody crossings associated with the projects are not in close proximity. The Commercial Metals Company Steel Mill Project would have in-stream impacts and result in the placement of permanent fill into an unnamed tributary to Kanola Creek. The MIDSHIP Project does not cross Kanola Creek; however, Kanola Creek does eventually flow into the Blue River downstream of the Mainline HDD crossing. Because of the limited concurrent projects occurring within the HUC-12 subwatersheds crossed by the MIDSHIP Project, and the limited locations where multiple projects would affect a sensitive fishery, we conclude cumulative impacts on fisheries and other aquatic resources are unlikely.

4.13.2.5 Special Status Species

The federally protected species described in section 4.7 of this EIS could potentially be affected by construction and operation of other actions occurring within the same area as the MIDSHIP Project. The MIDSHIP Project would not affect any state-listed protected species so there is no opportunity for a cumulative impact on these species. Midship Pipeline and the sponsors of other actions with a federal nexus (i.e., that receive federal funding or are subject to federal permitting) are required to consult with the appropriate federal, state, and local agencies to identify special status species that may be found in the area

of the actions; evaluate the potential impacts of their proposed activities on any identified species; and implement measures to avoid, minimize, or mitigate impacts on special status species and their habitat. Other projects without a federal nexus would still be required to comply with the ESA, but would not be required to consult with the FWS or to obtain incidental take permits unless there was potential for the project to harm, affect habitat, or otherwise result in the take of a federally listed species.

Because protection of threatened, endangered, and other special status species is part of the federal permitting processes, cumulative impacts on such species would be reduced or eliminated through conservation and mitigation measures identified during those relevant permitting processes. Therefore, we conclude that the other projects in combination with the MIDSHIP Project may have minor cumulative effects on special status species, but would not threaten the continued existence of any of these species.

4.13.2.6 Land Use, Recreation, Special Interest Areas, Public Lands, and Visual Resources

Land Use

Construction of the MIDSHIP Project would result in land use impacts on open land, agricultural land, forested land, and to a lesser extent, developed lands, open water, and wetlands (see discussion in section 4.8.1). The majority of the land use impacts associated with the MIDSHIP Project would be temporary because most land uses would be allowed to revert to prior uses following construction. However, a 50-foot-wide easement would be permanently maintained as open land in upland areas during project operations.

Of the actions listed in appendix L, those with the greatest potential for cumulative impacts on land use include electric transmission lines, pipeline projects, highway improvements, point location projects including oil and gas well sites and wind turbines, and compressor and booster stations that would be constructed within 1.0 mile and within 5 years of the MIDSHIP Project. These projects include:

- Blue Mountain Delivery Line Project;
- Blue Mountain Chisholm Trail Project;
- non-jurisdictional powerlines;
- Chisholm Trail Cryogenic Gas Plant;
- oil and gas drilling activities;
- Duncan-Longview Project;
- existing compressor stations and booster stations;
- Visio-Cana Tank Battery;
- Darlington Road – Roman Nose Project;
- Kingfisher Wind Project; and
- State Highway 53 Road Improvements Project.

The MIDSHIP Project would result in incremental changes to land uses associated with its permanent easement along the rights-of-way and at aboveground facilities, which is consistent with the changes in land use from other projects within the geographic scope. Because much of the affected workspace of the MIDSHIP Project is currently open or agricultural land and would return to preconstruction use, we conclude that the cumulative impacts on land use from the project, when considered with other projects in the geographic scope, would be minimal.

Recreation, Special Interest Areas, and Public Lands

As described in section 4.8.5, the MIDSHIP Project would affect recreation and special interest areas, including crossing Historic Route 66 and the NRI-listed Blue River, and crossing near the

Texoma/Washita Arm of the Tishomingo Wildlife Management Area. However, we are not aware of any other projects with the potential to affect these recreational or special interest areas.

The MIDSHIP Project would also cross about 18.9 miles of public land owned and administered by the CLO as State Resource Management Areas (see section 4.8.5). The Kingfisher Wind Project was constructed near public land that would also be crossed by the MIDSHIP Project at about MP CH5.2. Land managed by the CLO is commonly leased for a wide variety of uses, including wind farms and pipeline easements. We expect that the sponsor of the wind farm was required to construct across and restore CLO lands in accordance with the terms of the easement agreement(s), similar to what we anticipate would be required for the MIDSHIP Project. Midship Pipeline would also implement the Plan and Procedures to minimize the potential for land use impacts and to aid in reestablishing preconstruction conditions after construction. As a result, although the MIDSHIP Project would affect recreation, special interest areas, and public lands, no significant cumulative impacts on these areas would occur.

Visual Impacts

In general, visual impacts associated with the construction of the MIDSHIP Project pipeline facilities would be noticeable during construction, and would include the presence of personnel, equipment, and vehicles near active construction sites, as well as the removal of existing vegetation and exposure of bare soils. Impacts would subside after the pipeline is buried and the landscape has been restored and returned to preconstruction conditions, which would occur within a few growing seasons in open lands and would take considerably longer in forested areas. Visual impacts along pipeline rights-of-way have been minimized because the MIDSHIP Project would be collocated with or installed adjacent to existing rights-of-way for about 54 percent of the route. As a result, the visual resources along these portions of the project have been previously affected by other similar activities, limiting the change in the visual setting that would result from construction and restoration of the MIDSHIP Project pipeline work areas.

Construction of the new compressor stations and booster station would have a similar visual effect as construction of the pipelines but a greater visual impact on the surrounding areas during operations, especially at the Calumet Compressor Station and the Tatums Compressor Station, which are in the viewshed of one or more residences. Operational impacts would be minimized by locating aboveground facilities in rural locations, positioning lights to minimize their visibility, and using low-contrast paint colors. Meter stations associated with the MIDSHIP Project would be visually unobtrusive, and many are sited in previously developed areas, therefore the visual impacts from construction and operation of meter stations would be minimal.

The geographic scope for cumulative visual impacts includes the viewshed of the MIDSHIP Project facilities, which varies depending on terrain, forested vegetation, and other visual barriers. The project area generally consists of open land with gently sloping open terrain, and about 86 percent of the land crossed by the pipelines is classified as non-forested. For the purpose of this assessment, we considered projects and actions within 0.25 mile of the project pipelines, and within 1.0 mile of project aboveground facilities for their contribution to cumulative impacts on visual resources. All of the past, present, and reasonably foreseeable future projects listed at the beginning of this section are within this geographic scope, or have the potential to occur within this geographic scope. The electric transmission lines and wind farm represent permanent, noticeable changes in the visual landscape, and additional visual impacts would result from the existing compressor stations and booster stations, and the anticipated oil and gas drilling and storage facilities. Visual impacts contributed by the pipeline projects and the road improvement project are generally limited to the associated maintained right-of-way.

The MIDSHIP Project would contribute to cumulative visual impacts during construction, restoration, and operation of project facilities. However, the MIDSHIP Project would be primarily located

in rural areas and would generally be consistent with the existing visual character of the area. Consequently, we conclude that the MIDSHIP Project would result in minor contributions to cumulative visual impacts.

4.13.2.7 Socioeconomics

Present and reasonably foreseeable future actions could cumulatively affect socioeconomic conditions within the eight counties crossed by the MIDSHIP Project (geographic scope). A county-wide geographic scope for socioeconomics was selected because the primary economic and fiscal effects of projects are generally discernable or measurable at the county level, and the affected counties would experience the greatest impacts associated with employment, housing, public services, transportation, traffic, property values, economy, and taxes. The following present and reasonably foreseeable projects occur in the same counties as the MIDSHIP Project:

- Blue Mountain Delivery Line Project;
- Blue Mountain Chisholm Trail Project;
- non-jurisdictional powerlines;
- Chisholm Trail Cryogenic Gas Plant;
- oil and gas drilling activities;
- CaSE Project;
- Visio-Cana Tank Battery;
- Plains and Eastern Clean Line;
- Kilpatrick Extension Project; and
- State Highway 53 Road Improvements Project.

Construction of the Blue Mountain Delivery Line Project, Blue Mountain Chisholm Trail Project, non-jurisdictional powerlines, Chisholm Trail Cryogenic Gas Plant, Visio-Cana Tank Battery installment, and State Highway 53 Road Improvements Project are planned within the same timeframe as the MIDSHIP Project. The oil and gas drilling projects could also occur concurrently or in the foreseeable future. The Plains and Eastern Clean Line and the Kilpatrick Extension are also reasonably foreseeable projects at least partially within counties crossed by the MIDSHIP Project. Canadian, Stephens, and Kingfisher Counties have the greatest number of projects or actions within the same geographical boundary.

Because exact schedules are currently not known for reasonably foreseeable actions, this assessment conservatively assumes that these projects' construction schedules would have concurrent or overlapping construction schedules with the MIDSHIP Project. It is also assumed that these future projects would employ workers from the same labor pool in the MIDSHIP Project counties, with the exception of specialized construction crafts or trades. The sections below detail the effects of the MIDSHIP Project on employment, temporary housing, infrastructure and public services, transportation and traffic, economy and taxes, and environmental justice populations, and the potential for contribution to a cumulative impact on these resources.

Population and Employment

The MIDSHIP Project would employ a peak of up to 1,338 workers over a 9-month construction period, about 65 percent of which would be local hires. Local hires could include surveyors, welders, equipment operators, and general laborers. The actions listed above would have cumulative effects on employment during construction if more than one project is built at the same time. Given the small number of other projects within the cumulative geographic scope, the available labor pool (about 176,892 workers), and the proximity to urbanized areas (see section 4.9.2), we conclude that there is likely to be sufficient available labor in these counties to meet cumulative, temporary construction and operational requirements.

Housing

Temporary housing would be required for about 35 percent of the MIDSHIP Project construction workforce, which would temporarily reduce vacancy rates throughout the project area. Given the current vacancy rates (4.5 to 15.6 percent), the number of rental housing units in the area (more than 36,900), the number of hotel and motel rooms (4,552), and RV parks and campgrounds (2,121) available in the cities and towns in the vicinity of the project, construction workers for the MIDSHIP Project should not encounter difficulty in finding temporary housing and would not exhaust the available temporary housing stock. If construction occurs concurrently with other projects, temporary housing would likely be available but may be slightly more difficult to find and/or more expensive to secure in the short term; however, no displacement of permanent residents would occur. Moreover, increased oil and gas activity in this area of Oklahoma may drive the construction of new hotels and motels, which would add to available housing options. For these reasons, we conclude that the MIDSHIP Project, in combination with other projects in the geographic scope, would result in only minor cumulative impacts on temporary housing availability.

Public Services

The cumulative impact of the MIDSHIP Project and the other projects listed above on infrastructure and public services would depend on the number and size of projects that are being constructed with concurrent or overlapping construction schedules. The incremental demands of several projects occurring at the same time could strain the ability of some local police, fire, and emergency service departments, particularly in rural areas. The most substantial increases in the need for existing services would likely occur in counties involved in the SCOOP and STACK plays, which could have multiple oil and natural gas extraction, transportation, and processing projects with concurrent or overlapping construction schedules. The potential demands of present and foreseeable projects would be temporary, occurring only for the duration of cumulative construction activities. In addition, based on the number of police and fire stations, schools, and hospitals, there appears to be adequate public service infrastructure in the project area to accommodate the temporary and long-term needs of the MIDSHIP Project and other project workforces should the projects occur concurrently. For this reason, we conclude that the MIDSHIP Project, in combination with other projects in the geographic scope, would result in only minor cumulative impacts on public services. In addition, the various project sponsors could provide their own personnel to augment the local public services or provide additional funds or training for local personnel.

Transportation and Traffic

Construction of the MIDSHIP Project would have a temporary impact on road traffic in some areas and could contribute to cumulative traffic, parking, and transit impacts if other projects take place at the same time and in the same area. Traffic impacts at proposed railroad, highways, and major road crossings would be minimized by Midship Pipeline's use of drilling or boring methods that do not affect the road or rail surface.

Increased traffic, including heavy equipment and material deliveries would increase wear and tear on some road surfaces. In combination with the increased use of local roadways required by other actions, the combined increased use would likely accelerate the degradation and the need for early replacement of road surfaces. However, in the event that construction traffic associated with the MIDSHIP Project causes damage to the roads, Midship Pipeline would make repairs in accordance with the requirements set forth by the landowner or government authority having jurisdiction over the road. Because Midship Pipeline would repair any damage to road surfaces, other projects would likely have the same requirements, and increased traffic on roads would cease after project completion, we conclude that no long-term cumulative effect on infrastructure and public services would occur from the construction and operation of the MIDSHIP Project.

Economy and Taxes

The MIDSHIP Project would provide an increase in tax revenue for the states, counties, and other local economies through the payment of payroll tax, sales tax, property tax, and other taxes and fees. The total estimated payroll for the project would be substantial during the construction phase as detailed in section 4.9.2. Annual property taxes attributable to the project are anticipated to be paid for permanent long-term facilities. Other present and foreseeable future projects would also be expected to contribute to a net increase in payroll and tax revenues. Therefore, we conclude that the MIDSHIP Project, in combination with these other projects, would have both short- and long-term beneficial cumulative impacts on state, county, and local economies.

Environmental Justice Populations

Projects such as the MIDSHIP Project and the other past, present, or reasonably foreseeable projects listed above have the potential to result in cumulative beneficial and adverse effects on environmental justice populations, including impacts on air quality, noise, water pollution, hazardous waste, aesthetic values, community cohesion, economic vitality, employment, displacement of persons or businesses, farms, accessibility, traffic congestion, and safety. There are three environmental justice populations within the MIDSHIP Project study area (two in Canadian County and one in Carter County). Of the present or future projects identified, only oil and gas drilling activities in Canadian County could occur within one of these environmental justice populations and cause a disproportionate share of adverse environmental or socioeconomic impacts if no mitigation measures are implemented. However, long-term cumulative benefits could be realized through new jobs and wages, purchases of goods and materials, and tax revenues. The primary impacts associated with the construction of the MIDSHIP Project would include temporary noise, fugitive dust, and traffic. Long-term effects include air quality and noise impacts from the operation of aboveground facilities. As discussed throughout this EIS, Midship Pipeline would implement various measures to minimize such impacts and, as detailed in section 4.9.8, there is no evidence that the MIDSHIP Project would cause a disproportionate share of adverse environmental or socioeconomic impacts on any racial, ethnic, or socioeconomic group, or on block groups that meet the environmental justice criteria. For these reasons, we conclude that the MIDSHIP Project, in combination with other projects in the geographic scope, would not result in disproportionate cumulative impacts on environmental justice populations.

4.13.2.8 Cultural Resources

Cumulative impacts on cultural resources could only occur if other actions were to affect the same historic properties affected by the MIDSHIP Project (within the geographic limit of the project APE). Only the Blue Mountain Delivery Line Project, Plains All American Pipeline, LP, Darlington Road – Roman Nose Project, and the Kingfisher Wind Project would be within the direct or indirect APE of the MIDSHIP Project. Of those projects, only the Blue Mountain Delivery Line Project has been defined as a federal action. Therefore, cumulative impacts associated with the Blue Mountain Delivery Line Project would be reduced or eliminated through the implementation of measures designed to avoid or minimize additional direct impacts on cultural resources. The projects described above that do not require federal authorization would not be required to develop mitigation measures to reduce or avoid impacts on cultural resources. However, because Midship Pipeline would avoid and mitigate impacts on known cultural resources to the greatest extent possible, mitigate for any impacts that may be unavoidable, and comply with its *Procedures Guiding the Discovery of Unanticipated Cultural Resources and Human Remains* in the event that previously unknown cultural resources are discovered during construction, we conclude that cumulative impacts on cultural resources would be unlikely to occur.

4.13.2.9 Air Quality and Noise

Air Quality

As discussed in section 4.11.1, air quality impacts could include short-term impacts from construction-related fugitive dust and gasoline- or diesel-fired combustion engines. Operational impacts such as increased ambient air pollutant concentrations and the contribution to statewide total annual GHG emissions would also occur.

For the MIDSHIP Project to contribute to a cumulative impact from construction air emissions, the projects and actions would need to occur concurrently (temporal scope), and be within 0.25 mile from project construction activities. Planned projects that could contribute to a cumulative impact on construction emissions include:

- Blue Mountain Delivery Line Project;
- non-jurisdictional powerlines;
- oil and gas drilling activities;
- CaSE Project;
- Visio-Cana Tank Battery; and
- State Highway 53 Road Improvements Project.

Because construction-related emissions are generally localized, the potential for cumulative impacts would be limited to those areas where activities occur in close proximity to one another. Although specific requirements would depend on applicable permits and company policies, it is assumed that these other projects would use similar mitigation methods to control fugitive dust and would also maintain construction equipment to minimize construction-related emissions. During project construction, Midship Pipeline would mitigate fugitive dust emissions, as necessary, by spraying water or applying other commercially available dust control agents on unpaved areas subject to frequent vehicle traffic. Construction equipment would be properly tuned and operated only on an as-needed basis to minimize the combustion emissions from diesel and gasoline engines. Therefore, the MIDSHIP Project, in combination with these other projects, would likely result in only moderate, temporary cumulative impacts due to construction emissions.

Operation of the MIDSHIP Project would result in permanent air quality impacts associated with the ongoing emissions from the new compressor stations and booster station. Ongoing emissions are primarily products of combustion, and include criteria pollutants (NO_2, SO_2, CO, VOC, PM_{10}, and $PM_{2.5}$). Assessing the MIDSHIP Project's impact on ambient air quality requires modeling proposed emissions of the project, in conjunction with any background ambient air quality concentrations. Therefore, the MIDSHIP Project's cumulative effect on air quality with past and present sources has been quantitatively analyzed and would not result in a significant impact on local and regional air quality. These results are presented in section 4.11.1.3.

Projects or actions that are currently operating and are producing ongoing air emissions, or present and reasonably foreseeable future actions that would have operational air emissions within 50 kilometers of compressor stations and the booster station include:

- Blue Mountain Delivery Line Project;
- Blue Mountain Chisholm Trail Project;
- Chisholm Trail Cryogenic Gas Plant;
- oil and gas drilling activities (all counties);
- CaSE Project;
- Duncan-Longview Project;

- existing compressor stations and booster stations;
- existing oil and gas processing and storage facilities;
- Kilpatrick Extension Project; and
- State Highway 53 Road Improvements Project.

Emissions sources in the upstream oil and gas sector include equipment and processes used for drilling and production activities at or near well sites. These emission sources are generally not monitored under major source permitting programs and may or may not be subject to minor source permits (ODEQ, 2017e). Table 4.13.1-1 was derived from existing permits for oil and gas drilling activities, and shows the highest density of development within Stephens, Carter, Kingfisher, Grady, and Canadian Counties, which are at least partially within the geographic scope of both the Tatums Compressor Station and the Sholem Booster Station. The emissions from these activities are reflected in background ambient air quality measurements that have already been evaluated in section 4.11.1.3, and new well developments will be required to obtain the appropriate air permits or remain below set thresholds during operation.

Emission sources from midstream oil and gas activities, including aboveground facilities associated with the recently completed Duncan-Longview Project and the existing compressor and booster stations typically include products of combustion (e.g., NO_X, CO, SO_2, VOC, PM_{10}, $PM_{2.5}$) from engines, heaters, and combustion control devices; and VOC emissions from sources such as fugitive components and storage tanks. Emission sources from downstream oil and gas activities, including the existing oil and gas processing and storage facilities, vary depending on the facility type but are typically similar in nature to emissions generated from midstream oil and gas activities. The air modeling presented in section 4.11.1.3 demonstrates that the impacts from these existing facilities, in addition to the MIDSHIP Project, would not result in a significant cumulative impact on air quality.

Operation of the metering facilities associated with the Blue Mountain Delivery Line Project and Blue Mountain Chisholm Trail Project would generate small amounts of fugitive emissions, but these would be so small as to have a negligible impact on cumulative air impacts. The Blue Mountain Chisholm Trail Project's proposed Ratliff City Compressor Station is about 4.8 miles south of the Tatums Compressor Station. This facility would consist of two skid-mounted compressor engines totaling 4,145 horsepower. Potential annual emission rates associated with the facility are summarized in table 4.13.2-1.

TABLE 4.13.2-1

Potential Annual Emission Rates Associated with Ratliff City Compressor Station (tons per year)

NO_x	CO	VOC	SO_2	$PM_{2.5}/PM_{10}$	Total HAP	GHG (CO_2e)
23.69	7.92	19.78	0.07	1.21	1.90	19,927

Source: FERC's environmental assessment of the Blue Mountain Chisholm Trail Project is available for viewing on the FERC website under Docket No. CP18-17-000 at https://elibrary.ferc.gov/idmws/file_list.asp?document_id=14835926.

Midstream and downstream oil and gas activities, including the existing oil and gas processing and storage facilities, the Chisholm Trail Cryogenic Gas Plant, and the Ratliff City Compressor Station, typically require operating permits issued by the ODEQ Air Quality Division, and are required to report measurements of criteria pollutants, VOCs, and HAP emissions. Meter stations are typically exempt from permitting due to their size, and the amount of potential emissions generated are covered under minor source permits. The State Implementation Plan for federal air quality rules and regulations as implemented in the ODEQ air quality regulations has been approved by the EPA. The State Implementation Plan approved ODEQ air quality regulations, including those associated with NSR permits; therefore, the permits issued for these projects have been reviewed for compliance with EPA NSR permit regulations and are not

expected to result in significant degradation of air quality in the region. Air quality monitors maintained by the ODEQ support the fact that these past projects have not significantly degraded the air quality in Oklahoma because all of the monitors currently show attainment of the federal NAAQS for all criteria pollutants.

The Oklahoma Turnpike Authority's Kilpatrick Extension and ODOT's State Highway 53 Road Improvements Project would have a minor impact on operational emissions if traffic were to increase as a result of the added lanes. However, we conclude that these projects are unlikely to result in significant emission impacts on the local or regional air quality.

Emissions from the MIDSHIP Project from the three new compressor stations and one new booster station would cumulatively contribute a small proportion of emissions in relation to the combination of these other area projects. In addition, the impacts analyses provided in section 4.11.1.3 show that the air quality in the area would not be significantly degraded by addressing the impacts from operating emissions associated with both the proposed MIDSHIP Project and past projects. New developments and projects would be required to adhere to federal, state, and local regulations for the protection of ambient air quality. Therefore, we conclude that no significant cumulative impacts on air quality would occur.

Noise

Construction activities associated with the MIDSHIP Project would result in perceptible noise within 0.25 mile from pipeline or aboveground facility construction activities during daylight hours, and at nearby NSAs within 0.5 mile of an HDD location. Noise from HDD operations would be temporary, but might occur around the clock at certain points in the HDD process. Noise associated with pipeline and aboveground facility construction would also be temporary, and would be limited to daytime hours, which would minimize the impact.

The following projects are expected to be constructed within 0.25 mile of the MIDSHIP Project near the time of construction and would contribute to cumulative noise impacts if construction occurs simultaneously:

- Blue Mountain Delivery Line Project;
- non-jurisdictional powerlines;
- oil and gas drilling activities;
- CaSE Project;
- Visio-Cana Tank Battery; and
- State Highway 53 Road Improvements Project.

Pipeline construction proceeds quickly and any cumulative noise impacts would be limited to the immediate area of construction of the MIDSHIP Project. Construction would occur during daylight hours for a period of days or weeks in any particular location, and could overlap with any of the projects listed above; however, the MIDSHIP Project's contribution to construction noise impacts would not be considered significant. Therefore, construction noise from the MIDSHIP Project would contribute to cumulative noise impacts with other concurrent and nearby actions, but these impacts would be temporary and localized.

Operation of the project would have a long-term effect on noise levels in proximity to the proposed compressor stations, booster station, and meter stations. The noise associated with these facilities is likely to be perceptible at some nearby NSAs; however, Midship Pipeline has proposed mitigation measures such as acoustical building, exhaust stack silencers, combustion air intake stack silencers, and acoustically treated building wall and roof fan openings. Noise from the MIDSHIP Project's permanent facilities is not

anticipated to have an impact beyond 1.0 mile. The following projects are expected to or have the potential to contribute to operational noise impacts within 1.0 mile of a noise-emitting permanent aboveground facility:

- existing compressor stations and booster stations;
- CaSE Project;
- South Canadian Processing Plant;
- Okarche Gas Processing Plant; and
- Sholem Gas Plant.

Operation of the three proposed compressor stations and the proposed booster station would cause an increase over the existing noise levels between 0.1 and 8.4 dBA at nearby NSAs. Operational noise impacts from the other projects within 1.0 mile of the MIDSHIP Project compressor and booster stations cannot be quantitatively assessed, except when considered as part of the ambient noise levels evaluated in section 4.11.2.2. Although the MIDSHIP Project would contribute to cumulative noise impacts, the noise analyses determined that operational noise generated by the proposed MIDSHIP Project facilities would not exceed FERC's 55 dBA L_{dn} criterion. Therefore, we conclude that minor cumulative impacts on noise could occur at these locations.

4.13.2.10 Climate Change

Climate change, whether due to natural variability or as a result of human activity, cannot be represented by single annual events or individual anomalies. For example, a single, large flood event or particularly hot summer are not indications of climate change. Rather, a series of floods or warm years that statistically change the average precipitation or temperature over years or decades indicate climate change. However, recent research has begun to attribute certain extreme weather events to climate change (U.S. Global Change Research Program [USGCRP], 2017).

The leading scientific body on climate change in the United States is the USGCRP. Thirteen federal departments and agencies[26] participate in the USGCRP, which began as a presidential initiative in 1989 and was mandated by Congress in the Global Change Research Act of 1990. In May 2014, the USGCRP issued a report, *Climate Change Impacts in the United States*, summarizing the impacts that climate change has already had on the United States and what projected impacts climate change may have in the future (USGCRP, 2014). The report includes a breakdown of overall impacts by resource and impacts described for various regions of the United States. The report indicates that climate change has already resulted in a wide range of impacts across every region of the United States, and those impacts extend beyond atmospheric climate change alone and include changes to water resources, agriculture, ecosystems, and human health. As climate change is currently happening, the United States and the world are warming; global sea level is rising and acidifying; and certain extreme weather events are becoming more frequent and more severe. These changes are driven by accumulation of GHG in the atmosphere primarily through combustion of fossil fuels (coal, petroleum, and natural gas), combined with agricultural emissions and clearing of forests. These impacts have accelerated throughout the end of the 20th, and into the 21st century. Although climate change is a global concern, for this cumulative analysis we focused on the potential cumulative impacts of climate change in the Great Plains region where the MIDSHIP Project would be located.

[26] The following departments participate in the USGCRP: EPA, U.S. Department of Energy, U.S. Department of Commerce, U.S. Department of Defense, USDA, U.S. Department of the Interior, U.S. Department of State, PHMSA, Department of Health and Human Services, National Aeronautics and Space Administration, National Science Foundation, Smithsonian Institution, and Agency for International Development.